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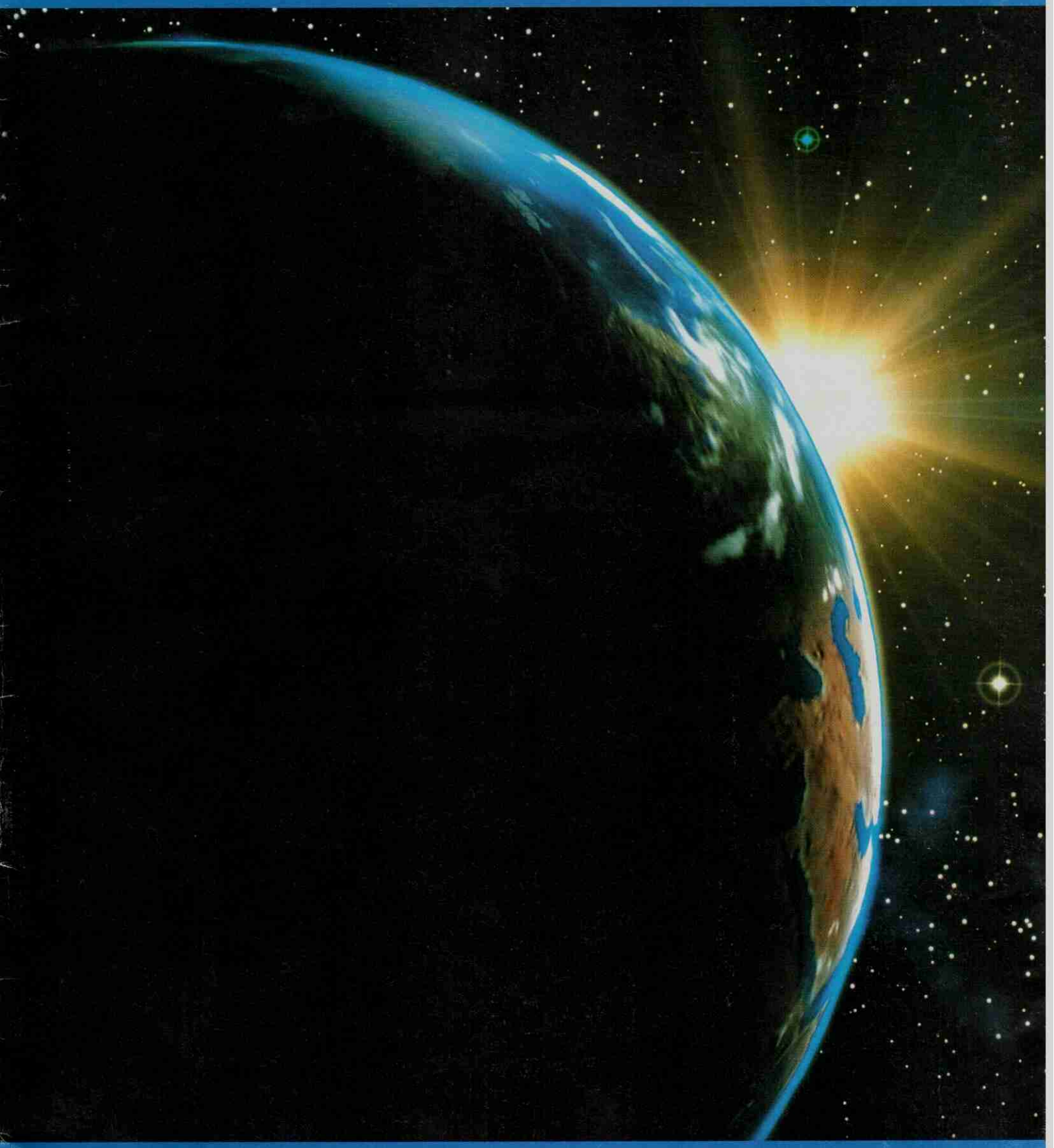
People & the Planet

Volume 8 Number 4



THE ECOLOGY OF HOPE • MILLENNIUM ISSUE

ONTO THE WEB

This final printed issue of *People & the Planet* is sponsored by the United Nations Population Fund, the World Conservation Union, the World Wide Fund for Nature, the International Planned Parenthood Federation and the Swedish International Development Co-operation Agency. It is published by Planet 21, an independent, non-profit publishing company in association with a wide range of international non-governmental organisations. Additional support for this issue comes from the Hewlett Foundation and the Simon Population Trust. None of the sponsors or supporters takes responsibility for articles in this publication. All are united, however, in the belief that people, their consumption, their technologies and their numbers, interact with the environment of our planet in ways which need to be explored – and that a path needs to be traced towards a sustainable future for healthy people living in a healthy world.

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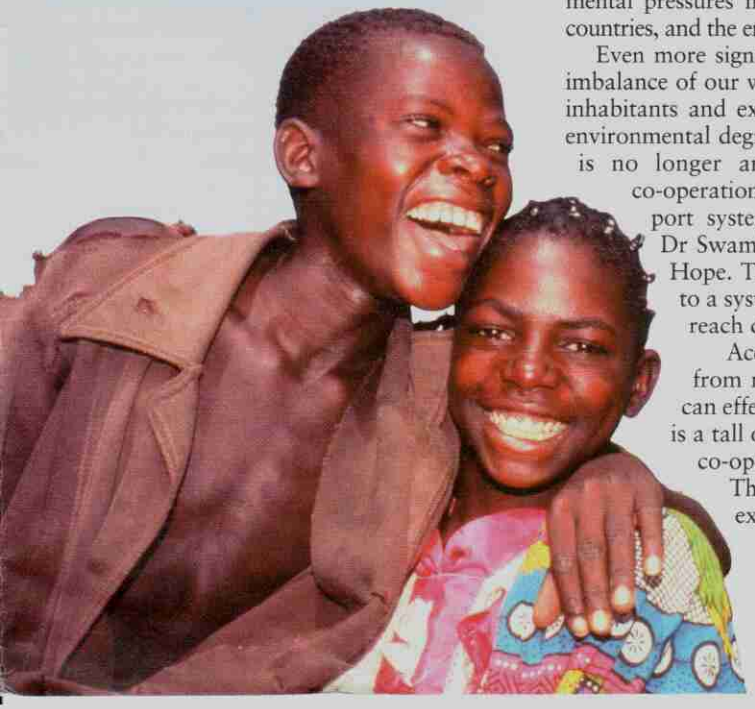

Forecasting the future

Twenty-three years ago, President Carter commissioned a report on the prospects for the environment at the turn of the century. The subsequent *Global 2000 Report* was ignored by President Reagan, but updated and published in 1982. It makes fascinating reading now, especially in the light of the latest report from the United Nations Environment Programme on the *Global Environment Outlook* (*GEO 2000*). The two reports show just how far we have come in our understanding of the challenge facing our earth home – and how urgent is the response required to meet it.

The opening words of the earlier report were prophetic: "If present trends continue, the world in 2000 will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now." That is certainly the case. Its more detailed findings demonstrate the problems of prediction. It estimated, for example, that the world's population in 2000 would be 6.25 billion (or 6.13 billion in the revised projection). Not far off the actual figure of just over 6 billion. But it put the rate of growth at 1.7 per cent, when the actual rate is much slower at 1.4. It said the annual addition would be 100 million, rather than the present 78 million. And its projection for the year 2100 was 30 billion, an outlandish figure by present day reckoning, although *GEO 2000* does point out that if fertility rates in developing countries stall at half a child more than the replacement level of 2.1 children per woman, population could grow to 27 billion rather than 9 or 10. All this represents a success for family planning and reinforces the urgent need to pursue the action plan for reproductive health and women's welfare, agreed in Cairo in 1994.

The 1982 report underestimated the growth in food production and the success of South Asia in increasing the general level of nutrition, though it was right to predict falling per capita food production in sub-Saharan Africa and the Middle East. It also failed to predict that energy prices would fall rather than rise after the oil price shocks of the 1970s, allowing many developing countries to improve their agricultural and economic performance. It was, however, right in forecasting the growing shortage of fresh water, the continuing destruction of tropical forests, the degradation of the land, the loss of species, the growing pressure on coasts and coral reefs, the impact of chemical and atmospheric pollution and the threat to the ozone layer and earth's climate from harmful emissions.

Ethics and equity

However, the most striking contrast between these two reports lies in the broad sweep of *GEO 2000*, its regional analysis, and the emphasis on the need to integrate environmental thinking into decision-making at every level. Among the emerging issues which are dealt with more fully in the latest report are the harmful impact of nitrogen on ecosystems – largely as a result of intensive agriculture and the burning of fossil fuels – the increase in natural disasters, the invasion of alien species as a result of globalisation, the increased environmental pressures from urbanization, the decline in the quality of governance in some countries, and the environmental impact of new wars and of increasing numbers of refugees.

Even more significant is the central place which *GEO 2000* gives to the structural imbalance of our world system. "The continued poverty of the majority of the planet's inhabitants and excessive consumption by the minority are the two major causes of environmental degradation. The present course is unsustainable and postponing action is no longer an option." Without inspired political leadership and intense co-operation between all regions and sectors to deal with this reality, our life support system will continue to decay, it says. This is a theme taken up by Dr Swaminathan in his important overview for this issue on The Ecology of Hope. The emphasis on market forces at all costs must give way, he argues, to a system based on ethics and equity, with a knowledge revolution that will reach down equally to women as well as men.

According to *GEO 2000* what is required is "a shift in values away from material consumption. Without such a shift, environmental policies can effect only marginal improvements." That, as Paul Harrison makes clear, is a tall order. It will, at the least take a major educational effort and massive co-operation from individuals, organisations, governments and industry. This final printed issue of *People & the Planet* gives some inspiring examples of just such millennium trailblazing.

John Rowley

newsfile

HUMANISING CAPITALISM

Globalisation has resulted in a dangerous polarisation between countries which benefit from the system and those that are merely passive recipients of its effects, according to the *Human Development Report 1999*, commissioned by the UN Development Programme.

Since the first *Human Development Report* was published 10 years ago, introducing the Human Development Index (HDI) as an alternative indicator of development:

- Over 80 countries have lower per capita incomes today than they did a decade ago
- Industrialised countries now hold 97 per cent of all patents world-wide
- Trafficking in women and girls for sexual exploitation has become a $7 billion a year business
- The income gap between the richest and poorest fifth of the world's population has grown to 74 to 1 (in 1997) – up from 30 to 1 in 1960
- Tanzania now spends nine times more on repaying debts than it does on health care.

"The world is rushing into greater integration, driven mostly by a philosophy of market profitability and economic efficiency. We must bring human development and social protection into the equation," says Dr Richard Jolly, co-ordinator of the Report. "Globalisation needs a human face."

As Professor Paul Streeten points out in a review of ten years of the *Human Development Report*: "More income is only one of the things that poor people desire. Adequate nutrition, safe water at hand, better medical services, more and better schooling for their children, cheap transport, adequate shelter, continuing employment and secure livelihoods and productive, remunerating, satisfying jobs do not show up in higher income per head, at least not for some time." Other non-material benefits, such as freedom of speech, safe working conditions, a satisfying family life, adequate leisure time and a sense of belonging to a community, are all highly valued in rich and poor societies alike.

Clive Shirley/Environmental Images

In a special contribution calling for public-private partnerships, Ted Turner, Founder of CNN, writes that "headway on poverty is not keeping pace" with global economic expansion. "It is as if globalisation is in fast-forward, and the world's ability to understand and react to it is in slow motion."

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CORAL PERIL

In 30 years coral reefs will be devastated by warming tropical oceans, says a new scientific report by Greenpeace. Rising sea temperatures will bleach the coral white and eventually kill most reefs unless predicted levels of climate change are avoided.

According to the report, the vast majority of Australia's 1000 km-long Great Barrier Reef – the world's largest coral reef – will be dead in around 30 years unless measures are taken to slow climate change.

The report, *Climate Change, Coral Bleaching and the Future of the World's Coral Reefs*, found that if global temperatures increase at levels projected by leading climate scientists, coral bleaching would increase in frequency and intensity all over the world. By 2030 to 2070, depending on the reef system, coral bleaching would be an annual occurance. "Coral reefs could be eliminated from most areas of the world by 2100," said the report's author, Professor Ove Hoegh-Guldberg, a marine biologist at the University of Sydney who has studied coral bleaching for 15 years.

Coral bleaching occurs when the maximum water temperature rises only slightly, in most cases just one or two degrees. The corals become stressed and expel microscopic organisms known as zooxanthellae, which colour their tissue and provide them with essential nutrients.

There have already been six episodes of coral bleaching over the past 20 years. The worst occurred in 1998, the warmest year on record and affected virtually all tropical reef systems around the world, including reefs in Australia, the Indian Ocean, Florida Keys, the Caribbean, the Red Sea and the Bahamas.

The economic impact of damage to the world's reefs could run into trillions of dollars and would affect hundreds of millions of people who depend on coral partly or wholly for their livelihoods, especially from tourist and fishing industries. Scuba diving in the Caribbean alone is expected to generate $1.2 billion by 2005. In developing countries, 25 per cent of the fish catch is provided by coral reef related fisheries and they provide an essential source of food protein for many millions of the world's poorer societies.

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- The extensive demand for reef fish in Hong Kong is threatening some species classified as "vulnerable" such as the Humphead Wrasse and Giant Group, says a report by TRAFFIC East Asia and the World Wide Fund for Nature Hong Kong. Around 30,000 tonnes of live reef fish are imported by Hong Kong each year, much of it smuggled in despite export bans. Such is the demand that traders are looking increasingly to the remote Pacific archipelagos to meet demand. What is worrying says Patrick Lau, the report's author, is that "the majority of reef fish consumed in Hong Kong have not reach sexual maturity. If the future breeding generation is eaten, where will next year's fish come from?"

CITY FORUM

Around three million rural dwellers in developing countries are estimated to be leaving their homes each year because their land can no longer support them. Land degradation, or desertification, has forced them to become migrants, a forum on Cities and Desertification was told earlier this year.

Over 130 mayors from cities in Africa, Asia, Latin America and Europe met in the German city of Bonn, in June, *writes John Madeley*.

Mayors told the forum of how rural people are making their way to the shanty areas of cities and putting a huge strain on services, such as housing, water supply, waste removal and treatment, health care and education, which are already over-stretched. Nearly half the mayors came from Africa, the most seriously affected continent.

The Ugandan capital, Kampala, was designed for 10,000 people. It now has 1.5 million residents. "People who usually come to the cities come from rural places where the soil is exhausted. The desert has come to the city – and it's having a really big impact," said Sarah Nkonge Muwonge, the city's acting mayor.

"If nothing is done to stop the root causes of desertification, around 30 million rural dwellers could be forced out their homes in the next ten years," said Fawzi Al-Sultan, President of the UN's International Fund for Agricultural Development, one of the forum's organisers.

• According to the International Red Cross 1999 World Disasters Report, "natural disasters" last year were the worst on record creating 58 per cent of the world's refugees. Last year, environmental problems such as drought, floods, deforestation and degraded land drove 25 million people from their land to already vulnerable squatter communities on the edge of fast-growing cities. This outnumbered those displaced by war for the first time ever.

TOXIC TIME-BOMB

Like a "time-bomb", huge stocks of dangerous obsolete and unused pesticides in Africa and the Near East will pose a threat to humans and the environment until 2030, if funding for waste disposal remains at today's low level, warns the UN Food and Agriculture Organisation (FAO).

Among the highly toxic and persistent pesticides identified were Aldrin, DDT, Dieldrin, Endrin, HCH, Lindane, Malathion, Parathion among many others.

It is estimated that there are several hundred thousand tonnes of obsolete pesticide stocks worldwide, with more than 100,000 tonnes in developing countries. FAO estimates the amount of pesticide stock leftover in Africa at 20,000 tonnes. The situation is particularly dangerous in Poland with 65,000 tonnes and the Ukraine with over 23,000.

So far, around $24.4 million have been spent on the removal of pesticides in Africa and the Near East, FAO said. To clean all obsolete pesticides spots in Africa would cost between $80-100 million. FAO is calling on governments and industry to step up their efforts and financial support to clean up problem. It is also urging governments to apply environmental benign methods of pest control, such as Integrated Pest Management to drastically reduce the use of, and reliance on, pesticides where possible.

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WOMEN ALERT

Economic policies aimed at curbing public spending are having an adverse affect on reproductive health services in an overwhelming majority of countries, warns a new report published by The Women's Environment and Development Organisation (WEDO).

Risks, Rights and Reforms, the seventh in a series of WEDO's monitoring reports, charts the serious challenges to progress in women's health and the environment in 50 countries around the world.

According to the report's findings, 70 per cent of countries participating in the WEDO survey say that user fees in public health systems have made reproductive health services unaffordable for the poor; while 54 per cent say that privatisation trends have reduced access to health services by the poor, with a special impact on women, the elderly, and immigrant and minority populations.

Environmental concerns also feature with 82 per cent of countries surveyed reporting on occupational health hazards faced by women, including increased pesticide exposure.

Among the report's alarming statistics is that one in three women in the US will develop cancer sometime during her lifetime. Nuclear contamination in parts of Russia has led to a 21 per cent increase in cancer. Almost a third of countries surveyed report incidence of breast milk contamination from pesticides and other toxins.

The report's finding "should sound a global alarm," says Jocelyn Dow, WEDO's Chair. "They are a call [to]...reverse disturbing economic, environmental and political trends that threaten the health and sustainability of our increasingly vulnerable planet."

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BEAR NECESSITY

The world's bears are under increasing threat according to a new report by WWF, *Wanted Alive! Bears in the Wild*. Almost all bear species have undergone dramatic population declines in recent decades mainly due to trade in their body parts, habitat destruction and human/animal conflict.

According to WWF's first-ever global review of the world's bears, habitat loss and hunting are having devastating effects on Asia's sloth, sun (honey) and black bears. It is possible that the sun bear is extinct in India and its presence in Bangladesh is doubtful. As numbers of Asian bears decline, increasing numbers of North and South American bears are being hunted to satisfy worldwide demand for bear parts.

South and Central American bears have also been seriously affected by logging, cattle ranching, and clearance for poppy and coca fields that feed the lucrative drug trade. The Mexican grizzly is now extinct while the spectacled bear struggles for survival mainly in the remaining montane forest along the spine of Ecuador, Colombia, Venezuela, Bolivia and Peru.

In Europe, human/animal conflicts are causing serious problems for bears. Spain and Greece's bears are unlikely to survive unless strict protection programmes are put in place. The authors of the report warn that France's few remaining bears are "doomed to extinction" unless drastic measures are taken soon.

However, lack of censuses and field studies usually make it very difficult to establish exact numbers of bears in the wild. "We know what is in the market place, but we don't know what is in the forest," said Elizabeth Kemf, Species Information Manager at WWF International, one of the co-authors of the report.

The only bear population that still lives throughout its original range, and whose population in some areas has actually doubled is the polar bear. However, it faces new threats in the form of chemicals such as persistent organic pollutants (POPs) and the effects of global warming on its marine coastal habitat.

The authors of the report emphasize that there is some good news for bears. They point out that in Austria, a six-year plan of bear reintroduction has resulted in an increase in bears. Most remarkable is a major shift in attitude by Austrian farmers and the general public to protect rather than persecute bears.

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Thomas D Mangelsen/Still Pictures

The ecology

Dr M.S. Swaminathan has had a remarkable career as a teacher, plant breeder, administrator, advisor, conservationist and practical reformer, both in India and on the international stage. The Research Foundation which carries his name began work ten years ago to carry out research and community development in his native Tamil Nadu. It is, he explains, "pro-nature, pro-poor and pro-women". It aims to ensure a kind of development that is not only environmentally sustainable but also socially equitable. Here, in a specially commissioned article, he describes the elements of a better world for the new Millennium.

The 20th century will soon end with remarkable achievements in every area of science and technology. In addition to impressive progress in physical and life sciences, we are ending this century with significant accomplishments in social evolution.

There are now uncommon opportunities for providing every child, woman and man with an opportunity for a productive and healthy life during the 21st century. Accomplishing this task will not however be easy, since economic, social and gender inequity is not only widespread but is increasing further.

Main picture: Science student studying electricity at college, Zambia.
Right: Selling medicinal plants from tropical forests, Brazil.

# of hope

Irene R. Lengui/Environmental Images

Achievements during this century in improving human health and longevity and food production and security indicate that progress in overcoming chronic social ills can be rapid, provided appropriate blends of political action, social mobilisation and technology development and dissemination can be fostered.

One clear statement on how science and technology could be mobilised to meet the basic needs of every single member of the human family is contained in a declaration by nearly 2000 scientists from all parts of the earth, who participated at a World Conference on Science convened by UNESCO and the International Council for Science (ICSU) at Budapest, Hungary earlier this year.

The Budapest Declaration on Science and the use of scientific knowledge states "We all live on the same planet and are part of the biosphere. We have come to recognise that we are in a situation of increasing inter-dependence, and that our future is intrinsically linked to the preservation of the global life-support systems and to the survival of all forms of life. Science should be at the service of humanity as a whole, and should contribute to providing everyone with a deeper understanding of nature and society, a better quality of life and a sustainable and healthy environment for present and future generations."

Our aim in the early part of the coming century should be the initiation and spread of a Knowledge Revolution for ending economic and gender inequity.

The Declaration further states, "Science and Technology should be resolutely directed towards prospects for better employment, improving competitiveness and social justice." The declaration calls for special attention to the expansion of scientific literacy and skills among women and families living in poverty.

The science agenda-for-action adopted at Budapest calls for scientific advice to become an essential factor in informed policy making. It also recommends that "all countries should protect intellectual property rights (IPR) and recognise that access to data and information is essential for scientific progress".

Thus, the World Conference on Science, while recognising the need for greater efforts in harnessing science for meeting basic human needs, also notes that proprietary science is expanding and that research designed for public good and supported by public funds is shrinking. The earlier slogan, "publish or perish" is getting replaced by a new one, "patent or perish". The veil of secrecy in scientific work is getting rapidly enlarged. The scientific problems relating to the health and livelihoods of the poor will tend to get neglected, since under a market-driven scientific regime, "orphans will remain orphans".

Giacomo Pirozzi/Panos Pictures

As a follow-up to the Budapest Conference, it is necessary for every nation and for the international scientific community to develop some basic ground rules for ensuring that science serves this public good. Such a paradigm shift from a materialistic to a humanistic scientific era will call for international co-operation in adopting a package of measures such as the following:

★ Enhance support from public funds for research relating to basic human needs and environment protection.

★ Make a distinction between discovery and invention with reference to patentability. For example, make patenting of DNA sequences in human and plant genomes ineligible.

★ Introduce compulsory licensing of rights in the case of patents of relevance to the food and health security of the poor and the ecological security of the planet.

★ Reduce the life span of patents particularly in the field of information technology.

★ Revise the Trade Related Property Rights (TRIPS) component of the World Trade Agreement so as to harmonise its provisions with those of the ethics and equity provisions of the Convention on Biological Diversity.

★ Incorporate in the World Trade Agreement a provision which enables member nations to tailor import policies which will enhance and not erode the livelihood security of the poor.

To help governments ensure that trade and development policies enhance ecological security and livelihood opportunities for women and men living in poverty, a World Trade Agreement Contract Facilitation Service should be established consisting of social scientists, gender specialists, environmental and employment experts. Such a service should be mandated to assist in converting the "trade and not aid" concept of poverty alleviation from rhetoric to reality.

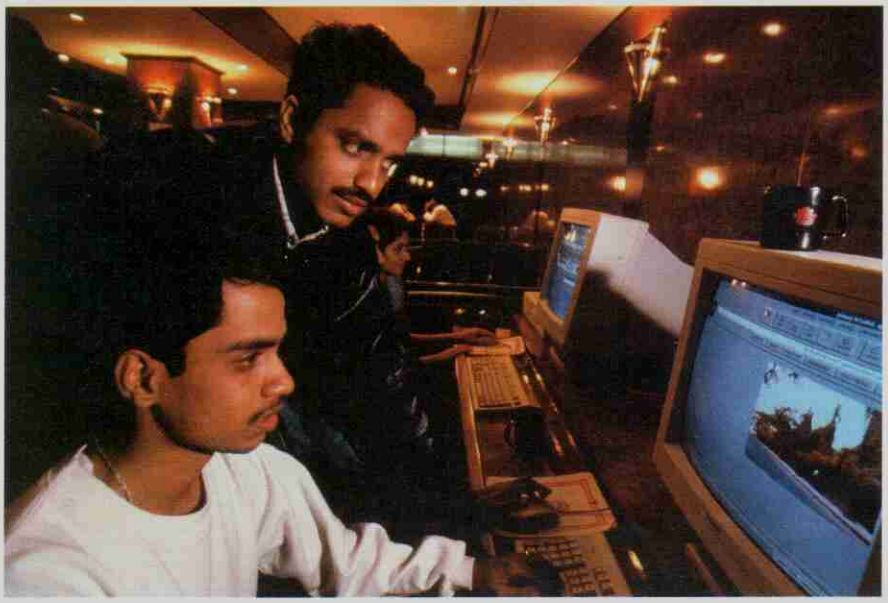
The ecology of hope movement will become a reality only if principles of ethics and equity govern all areas of human endeavour. Nowhere is this more apparent than in the field of life science industries. For example, what we now refer to as "medicinal plants" are the products of observation, selection and conservation by tribal and rural families over several centuries. Yet these primary conservers of material and holders of knowledge live in poverty, while those who use their knowledge and material in breeding and biotechnological enterprises live rich.

Since the onset of the Industrial Revolution in Europe, technology has been a major source of economic inequity among nations and communities. If technology has been a cause of inequity in the past, today we have an opportunity to make technology an ally in the movement of social, gender and economic equity. Modern information technology provides this opportunity.

Preventing wars

Knowledge and skills can now be gained at a fast pace. However, the technological and skill empowerment of the poor cannot be achieved through programmes designed on the basis of a patronising, top-down approach. The information provided should be demand and need-driven and the knowledge centres should preferably managed by women belonging to the socially and economically underprivileged sections of the society. Our aim in the early part of the coming century should be the initiation and spread of a Knowledge Revolution for ending economic and gender inequity.

The accomplishment of the tasks I have outlined so far requires considerable technical, managerial and financial resources. Indra de Soysa and Nils Petter Gleditsch, of the International Peace Research Institute, Oslo, have studied the causes of armed conflicts during the last 10 years. They found that



Hartmut Schwarzbach/Still Pictures

violent conflicts in most cases could be traced to economic rather than ideological differences. They have hence suggested that investing in agriculture which helps to promote food and livelihood security in many nations is an effective strategy for preventing future wars, eradicating poverty, preventing environmental destruction and reducing violence.[1]

Unfortunately even now, far too high a proportion of national GDP is being spent on arms and military equipment as compared to programmes designed for poverty eradication and meeting the basic needs of the underprivileged sections of humankind. The so called "peace dividend" still remains only in the realm of possibility, as pointed out by the International Commission on Peace and Food. (*Swaminathan, 1994*).[2]

The year 2000 has been appropriately designated the International Year for the Culture of Peace. Without peace and human security, it will not be possible to ensure the basic human needs to every child, woman and man. It will be appropriate to recall on this occasion what Dwight D. Eisenhower, a great war leader who subsequently became the President of the United States, stated on August 16, 1953: "Every gun that is made, every warship launched, every rocket signifies in the final sense a theft from those who are hungry and are not fed, from those who are cold and are not clothed. This world in arms is not spending money alone. It is spending the sweat of its labourers, the genius of its scientists, the hopes of its children."

Harnessing science and technology to fulfil the basic minimum needs of every child, woman and man living on our planet will be possible only if this message becomes central to the ethos of human culture.

Guiding principle

To sum up, we are ending this century with a huge stockpile of scientific discoveries and technological innovations. This stockpile is more than adequate to help all nations to provide every adult human being an opportunity for a healthy and productive life and every new-born child a happy future. It is therefore a sad commentary on our political, social and spiritual value systems that the number of children, women and men living in poverty today exceeds the entire human population of our planet at the beginning of this century.

Unsustainable life styles and degrading poverty co-exist everywhere. This is the greatest failure of the developmental pathways and strategies adopted during this century. Can we lay the foundation for the emergence of a new political, social and scientific commitment to end the irony of widespread human misery and deprivation prevailing in the midst of uncommon opportunities for a better common present and future for all? In my view we can, provided every one of the nearly two billion persons who are enjoying a healthy and productive life today will keep the following advice of Mahatma Gandhi as the guiding principle in his/her day-to-day life and work.

"Recall the face of the poorest and the weakest man whom you have seen, and ask yourself, if the steps you contemplate are going to be of any use to him. Will he gain anything by it? Will it restore to him control over his own life and destiny?" ■

Dr Swaminathan is Chairman of the M.S. Swaminathan Research Foundation in Madras, India.

1. de Soysa, Indra and Nils Petter Gleditsch, 1999, *To cultivate peace – Agriculture in a world of conflict*. International Peace Research Institute (PRIO), Oslo, Norway.

2. Swaminathan, M S (chairman), 1994, *Uncommon opportunities: An agenda for peace and equitable development, The report of the International Commission on Peace and Food*. Zed Books, London and New Jersey.

William Campbell/Still Pictures

Left top: Nutritious vegetables, Malawi.
Left bottom: Internet cafe, Bangalore, India.
Right: Tree seedling for reforestation project, Kenya.

Thirty years ago, Paul Ehrlich awoke the world to the coming population bomb. Now, says **Paul Harrison**, the closely related consumption bomb may become an even greater threat.

Consumption bomb

It is three decades since we passed the peak world population growth rate of 2.04 per cent. Annual additions too are now a decade past their peak of 86 million a year. They are currently running at 78 million a year and are heading downwards.

A peak in total numbers, however, still lies at least four or five decades ahead. On the UN Population Division's 1998 projections, the total is likely to reach 8.9 billion in 2050. The long range medium projection, which has not been updated since 1996, expects world population to level out at just under 11 billion in 2200 AD.

However, this is based on assumptions that are increasingly questionable. More and more countries are reaching levels of female fertility that are not enough for replacement – below 2.1 children over the lifetime of each woman. At the latest count there are 61 countries in this category. Of these 23 had very low fertility, below 1.5.

This situation is unprecedented in times of global peace and economic growth. The UN medium projection assumes that where fertility is very low it will rise again to 1.7-1.9 children per woman. In all countries where fertility is currently above replacement level of 2.1, it assumes that it will not fall below that level.

Yet fertility has fallen below replacement level in so many countries, with such different cultures and different stages of economic growth, that it is increasingly looking as if low fertility may be here to stay.

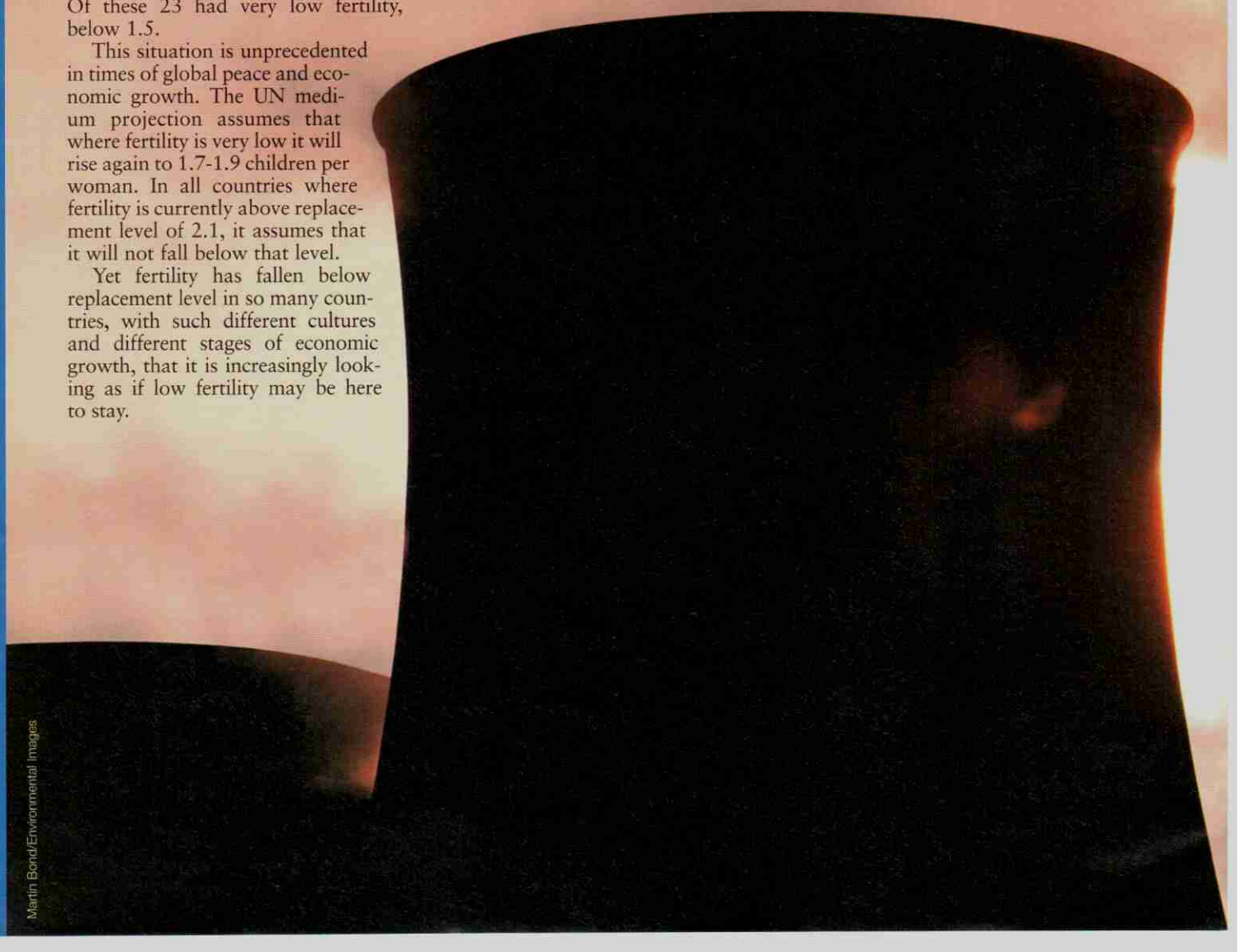
If this became the case, then world population may peak at somewhere between 8 and 9 billion. Thereafter it may well begin to decline. The 1996 long range low projection has world population falling to 5.6 billions in 2100 AD.

None of this means that reproductive rights should have lower priority in future. Their contribution to the health and welfare of women and children are clear. Many poor countries in Africa and South Asia face huge population increases which will be hard to accommodate without major problems of land and water scarcity. In these areas reproductive rights and women's education must receive a very high priority.

Increasingly our concern must focus on consumption, and how we can cope with the effects of its inexorable increase.

Over the past 25 years, world population increased by 53 per cent, but world consumption per person (measured by income) by only 39 per cent. Assume that consumption continues to grow at 1.4 per cent – the average between 1965 and 1997. Then over the next 50 years world consumption per person will rise by 100 per cent, while population will rise by only half that amount. As time goes on the preponderance of consumption will increase more and more.

There is a crucial difference between population and consumption aspirations. If fully assured of children's survival, most people have quite modest desires for family size. But their desire to consume knows no upper bounds. As wealth increases,



Martin Bond/Environmental Images

Rojo-UNEP/Still Pictures

people double-up their possessions: two or three cars, two bathrooms, two homes with all contents, two or three holidays a year.

Appliances improve every year and old ones "need" replacing. New needs are created that never existed before. Globalisation is making products cheaper than ever. TVs are no longer uncommon even in African shanty towns.

The number of households is increasing as people live longer and family breakdown becomes more common. Smaller households consume considerably more per person than large.

Moreover, consumption is politically very difficult to restrain. No-one can get elected promising people they can earn and spend less, or re-elected if they fulfil their promises.

In view of this much of the burden of reducing our environmental impact will rest on technology. Technology will have to deliver major shifts in improving resource productivity, and in reducing the amount of waste we create. All our institutions and forms of management which affect technology will need to be geared to this end.

In some areas the record has been good and looks likely to remain so. Productivity has kept up with demand in the case of resources that are traded on markets, and that are under the direct control of people or companies affected by shortages or prices. Global food production has kept pace with demand: although land and cereal production per person has declined, average intakes of calories and protein have continued to improve and are at record levels. Malnutrition persists, but this is due to poverty and landlessness, not to the inability of the world to produce enough food.

We have not encountered any limiting shortage of any key mineral resources or of energy. Nor are we likely to, because we continually economise and find substitutes. There has been a gradual reduction in the material used for each unit of production.

The prospects are much worse for resources that are not traded on markets or subject to sustainable management, as yet. These include groundwater, state forests, ocean fish, biodiversity in general. They include communal waste sinks like rivers, lakes and oceans, and the global atmosphere. In all of these areas it looks likely that things will get quite a lot worse before they get better.

These kinds of resources and sinks are not under the direct control of people affected by shortage or damage. People wishing to change the way a common resource or sink is used or managed have to pass through the legal or political system. They must organise, take out lawsuits against polluters, pressurise legislators and so on.

Political responses are typically slow. Usually the majority of voters have to be convinced of the need for action before politicians will risk taking action. Even then powerful and rich vested interests will lobby hard for the status quo, and will often succeed in frustrating changes that are desired by a global majority. America's coal, oil, and car lobbies have stood in the way of any significant US commitment to reduce carbon dioxide output, and the US is the world's largest emitter of carbon dioxide.

Usually there has to be very widespread and very visible environmental damage before action is taken. The thinning of the ozone layer fitted that category well and the response was swift. North Atlantic fishing reached that point in the 1990s, yet politicians shied away from taking adequate action until the last moment: fishing stocks plummeted and there was massive job loss. Global warming is still long way from the damage being widespread enough, and attributable clearly enough to human activities, for politicians to be ready to speed up the move into renewable energy.

The question with the common resources and sinks is always: will we react in time? The answer is all the more difficult because we usually don't know in advance what is "in time." Many critical changes are subject to threshold effects. When a certain point is crossed, very sudden and disastrous change can occur with little warning. In many cases we do not know where the thresholds lie.

Prudence dictates a preventive approach – a stitch in time saves nine. But the history of environmental problems shows that politicians rarely act decisively until the brink is reached, and it will always be touch and go whether we are pushed over it or not. ■

Main picture: Increased burning of fossil fuels has contributed to global warming. Top Right: Fish stocks have plummeted worldwide.

Paul Harrison, a Contributing Editor of *People & the Planet*, is author of The *Third Revolution*, Penguin Books, 1993.

Millennium hopes

Twéec Photos

Nafis Sadik

The search for harmony

Our foremost hope must be to ensure that our planet realises a harmonious balance between population, environment and development, consistent with the goals of the International Conference on Population and Development (ICPD) in 1994.

Much progress has been accomplished in the last five years. Many countries have embraced and strengthened policies and practices essential to achieve the ICPD Programme of Action, including increased access to reproductive health care, gender equity, equality and empowerment of women. And many are moving towards a recognition that improvements in the quality of life depend upon a greater understanding of the overall inter-relationships between population, environment, poverty, social and economic progress.

Many challenges however remain. The Special Session of the United Nations General Assembly in 1999 confirmed the consensus of ICPD and called for continued commitment and action to fully achieve its goals. We must give priority to ensure access to quality education and health care, including reproductive health/family planning and rights, eradication of sexual and gender-based violence, sexually transmitted diseases, especially HIV/AIDS, reduction of maternal mortality and creation of an enabling environment for women and girls to achieve full empowerment.

We must support these goals and encourage changes in the attitudes and values of men in particular to bring about a partnership for the realisation of qualitative changes in life for all. Special priority must be paid to protect the reproductive health and rights of the billion young people who are beginning their reproductive life.

It is my hope that the new millennium will find a world that defines progress not just in narrow economic terms but in social, ethical and human dimensions, with safety nets and minimum needs met for the most vulnerable, and where people and planet can be in harmony.

Dr Nafis Sadik is Executive Director of the UN Population Fund.

Giacomo Pirozzi/Panos Pictures

Maritta Koch-Weser

Biological century

© IUCN

Today's scientists have an unprecedented ability to understand biological resources, and know how to put them to good use for the benefit of mankind. Indeed, as we enter the next millennium, we enter the biological century, one in which biological resources will be seen as our most valuable asset.

Why then are we not making more progress in the conservation of biological diversity? Why the continuing disastrous trend of past decades – loss of biological diversity at an unprecedented and ever accelerating rate in all parts of the world? How can we explain the dichotomy between the growing appreciation of the economic value of biodiversity, and the destruction of that very capital?

The list of reasons is long, but one stands out: inadequacy in social and spatial organisation for environmental management. Eco-systems – "eco-spaces" – and modern-day socio-political, administrative spaces do not match. This explains many of the shortfalls in integrated eco-system management. Sustainable environmental management only becomes possible when human communities strive to adapt their organisation and co-operative systems to the specific requirements of their ecosystem. Hence the call for eco-community co-operation.

Mark Edwards/Still Pictures

In the absence of ecosystem management orchestrated by the very people who use them, we see great dysfunction. And the result of this dysfunction is destruction and definitive loss of biological resources. Watersheds are not maintained, undermining river life. Coastal zones, lakes and regional seas are more degraded and polluted than ever. Tropical rainforests are cleared or destroyed by fires.

But hope there is. There are a few shining, promising examples, cases where environmental co-operation works – transboundary parks or the joint management of a riverbasins – where communities have established co-operative environmental management systems across customary institutional boundaries.

The challenge is to move from exceptions to eco-community co-operation as a general rule. Eco-communities can be the stewards of ecosystems: virtual, resource-sharing communities that will often straddle several political units. Eco-community neighbours will jointly achieve patterns of sustainable use. Jointly, they will be the true guardians of the life (or death) of many species.

Using its unique structure, that brings together governments and civil society, The World Conservation Union (IUCN) is happy to assist in promoting social strategies for environmental conservation.

Dr Maritta R. von Bieberstein Koch-Weser is Director General of The World Conservation Union (IUCN), one of the founding sponsors of *People & the Planet*.

Claude Martin

Promising signs

Before looking into the future, one needs to reflect on what has gone before so as to gain the necessary perspective on which to base any projections. Looking back over the last generation – roughly the last 25 years – one realises how much the world's natural resources have come under pressure.

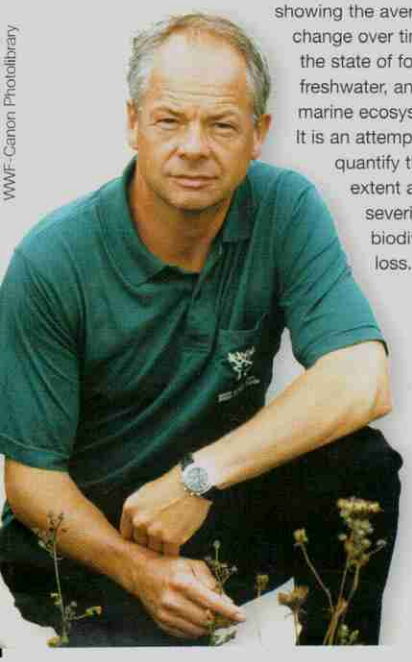
Consider for a moment the changes in WWF's priority biomes – forests, freshwater ecosystems, and oceans and coasts: the Living Planet Index (LPI)* shows a 10 per cent decline for forest area, 45 per cent for freshwater ecosystems, and 35 per cent for oceans and coasts. In fact, the 10 per cent decline in forest cover probably masks a greater, but unquantified, loss of forest quality and biodiversity, particularly in temperate forests.

It would take more than a few years to turn such trends around – no matter what, this is the nature of global trends. We will therefore be in the business of fighting for conservation for a considerable time into the next century. In the meantime, we will undoubtedly lose an important part of the world's biodiversity. This is not a pessimistic view; it is sheer realism.

So, can there be any hope? Without contemplating the complex reasons for the rapid decline of the world's natural assets, it is fair to say that man is the only problem. But man is paradoxically also the only solution to this problem. And this perhaps is where hope lies, in the continued understanding and responsibility of human societies to take care of the environment. We see promising signs of this, but more effort must be focused on people's consciousness and empowerment to act.

Dr Claude Martin is Director General of WWF International.

*The LPI is a measure of the health of global ecosystems and biodiversity, based on data showing the average change over time in the state of forest, freshwater, and marine ecosystems. It is an attempt to quantify the extent and severity of biodiversity loss.



WWF-Canon Photolibrary

Mats Segnestam

Taking a new road

The most important, vital change that needs to occur during the coming years is the realization by a large majority of the people of the world that present development, in the north and in the south, is environmentally unsustainable, and therefore also economically and socially unsustainable, and that a continuation of this state of affairs is simply not an option.

This implies that people must understand – develop an instinct for – what environmentally sustainable development is, in a local, regional, and global context.

In order to achieve this we must clarify, make apparent, demonstrate, make known, make understood, make felt, as many as possible of the linkages between environment on the one hand, and economy, conflict, unwanted migration of people, health and other social aspects, on the other. We must create and establish an intuitive understanding that, for example: water is a finite and fragile resource, biodiversity is the basis for life for all people, economic growth is not an end in itself and can be negative if wrongly based...The list is long.

Therefore, children must quickly get access to knowledge in these areas, environmental economists must get massive support (not only in financial terms), leadership in politics, in governments, in business, and in the civil society needs to be encouraged and challenged much more than hitherto.

We must provide clear signals and must therefore also develop the environmental and sustainable development indicators we all need at different levels.

My hope and desire is that all this will happen and that development organisations, Sida as well as others, understand the magnitude of their task and only support the good forces in the world's march along the new, changed route. My commitment for the next millennium – as long as I am there – is to contribute to the necessary processes of change as much as I can.

Mats Segnestam is Head of the Swedish International Development Co-operation Agency's Environment Policy Division.

Mark Edwards/Still Pictures

Ingar Brueggemann

Fighting taboos

My first wish is for IPPF to be tenacious in its continuous, unstinting support of family planning in its original sense.

Secondly, I would like to see wider recognition of the urgency with which IPPF must move into the sexual and reproductive health arena, including fighting for the rights of women, men and young people in the many areas of the world still suffering from societal taboos.

Thirdly, I want IPPF to be visionary in recognising that young people, women and men need supportive social and economic environments to help them plan and space the children they would like to have. Current educational and economic requirements and circumstances have become very child unfriendly, as the low birth-rate countries illustrate.

Finally I hope to see much better understanding of inter-generational communication and support as IPPF steps up its efforts to support society in its sexual and reproductive needs. ■

Ingar Brueggemann is Director-General of the International Planned Parenthood Federation based in London.

UN/DPI Photo/Eskinder Debebe

A look into a future world of 8 billion humans by **Don Hinrichsen** and **John Rowley.**

Planet Earth

Forecasting the future is asking for trouble. There are too many interacting uncertainties and too many unknowns. The Soviet Union collapsed only months after one eminent historian was predicting its survival long into the 21st century. Indian famines, forecast in the 1960s, have thus far been averted. No one quite knows how fast the earth will warm.

But some factors are more certain than others. Because tomorrow's parents are alive today, population projections for the next quarter century are reasonably predictable, (although the HIV/AIDS pandemic has already had an impact on future forecasts). And related resource challenges are quite visible.

It is now clear that population growth in the next 25 years will not only take place very largely in the less developed countries, but most noticeably in certain regions such as South Asia and sub-Saharan Africa. Pakistan, for example is expected to add another 90 million people to its population of 146 million, while Nigeria could nearly double its numbers from 113 to over 200 million. By contrast, Europe's population will decline over coming decades. Some of the likely consequences are outlined below.

Food forecast

As the world's population grows to around 8 billion by 2025 – 35 per cent more than in 1995 – the demand for food and fibre will rise by even more as incomes rise, diets diversify and urban growth accelerates.

But, according to the International Food Policy Research Institute (IFPRI), if present levels of investments in agriculture and social welfare continue, food grain production in developing countries will only increase by about 1.5 per cent a year over the next two decades. Livestock production, it estimates, will grow faster at 2.7 per cent. But both these levels are much lower than in previous decades and will see population outstripping supply unless there is a big increase in developing country imports.

Even if this happens IFPRI believes that one out of four children under six years of age will still be malnourished in 2020. This is a slight improvement on the situation in 1995 when one out three children were malnourished, but disappointing nevertheless.

But can this really be achieved? Only, IFPRI says, if a big effort is made to improve the capacity of developing countries to enhance the wellbeing of the poor, improve research and extension systems, develop better management and markets and expand international assistance. A big effort will also have to be made to avert the consequences of widespread soil degradation, especially in sub-Saharan Africa and poorly irrigated areas of South Asia (see below).

Liquid of life

One limiting factor in this equation will be the availability of water, without which the blue planet would be a dead and barren wasteland. Today, 31 countries with a collective population of half a billion people are experiencing chronic water shortages. Within 25 years the figure is expected to explode to 3 billion in close to 50 countries, making up more than a third of the world's projected population.

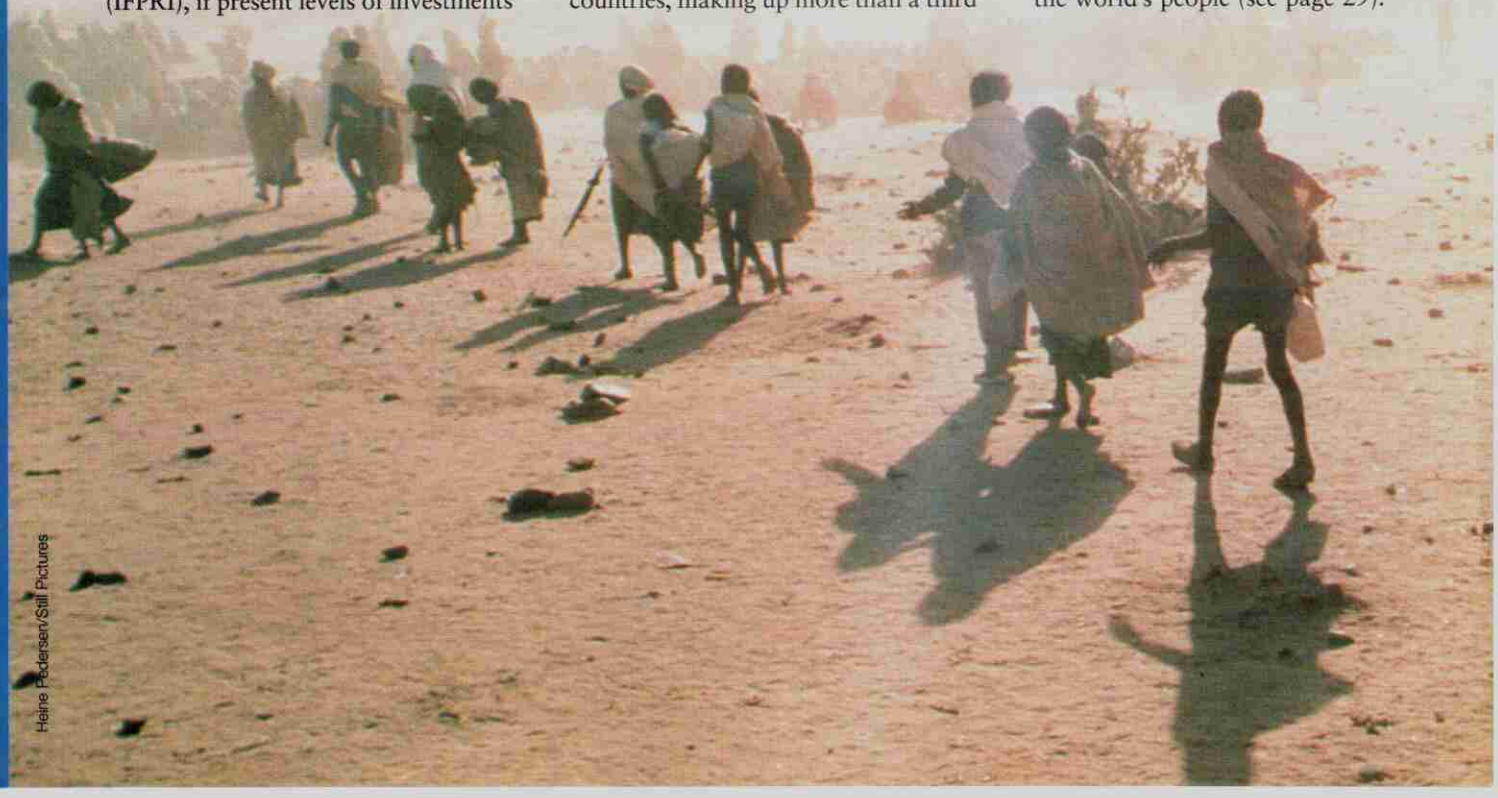
The main reasons for this are population growth and rising consumption. In the last half century, for example, annual demand for water has grown twice as fast as population. Especially worrying is the overpumping of underground waters in countries such as India. According the International Water Management Institute (IWMI), water in India is being pumped at twice the rate it is being replenished by rainfall. The consequence, it speculates, could be a reduction of a quarter in India's harvest, at a time when population there is increasing by 100 million in each decade.

Forest lungs

Another desperate concern is the continued destruction of the earth's forest mantle, which absorbs carbon dioxide and produces oxygen, anchors soils, regulates water flow, modifies climate and provides habitat for countless species of plants and animals.

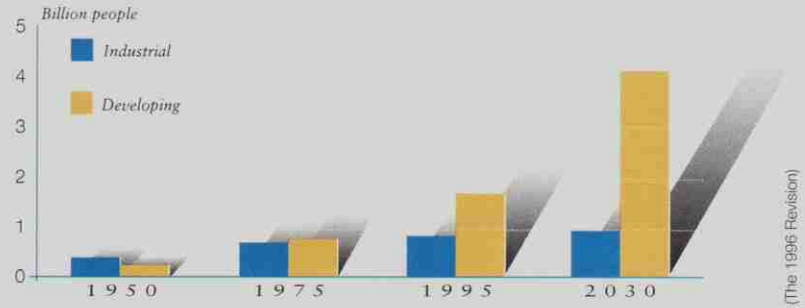
Each year an area of forest the size of Nepal is cut, bulldozed or razed by fire. It is a process that has destroyed half the world's original forest cover of some 3 billion hectares, mostly in the last 40 years. Only a fifth of what remains is 'frontier forest', undisturbed by human activities, says the World Resources Institute.

And, according to a recent report by Population Action International (PAI), the number of people living in countries with critically low levels of forest cover could triple by 2025, rising from 1.7 billion to 4.5 billion – or from nearly a third to over a half of the world's people (see page 29).



Heine Pedersen/Still Pictures

2025



URBAN POPULATION IN INDUSTRIAL & DEVELOPING REGIONS, SELECTED YEARS
Population increase in developing country cities will continue to be the distinguishing demographic trend of the next century, accounting for nearly 90 per cent of the 2.7 billion people projected by UN demographers (in the medium growth scenario) to be added to the world population between 1995 and 2030

Source: World Urbanization Prospects (The 1996 Revision)

Degraded land

Similar projections point to a critical loss of cropland per person, as population increases in some less developed countries. In Ethiopia, for example, where population is projected to grow from 60 to 100 million by 2025, the current 0.12 hectares per person, will be nearly halved. The same factor is a crucial element in migration from the land and the rise in the number of 'environmental refugees', already numbering some 25 million according to the *Environmental Exodus* report by Myers and Kent.

The situation is not helped by the steady degradation of soils in many parts of the planet.

Worldwide, nearly 2 billion hectares of crop and grazing land – an area larger than the United States and Mexico combined – suffer moderate to severe degradation. To blame are soil erosion, poorly built irrigation systems and other inappropriate farming systems, including the misuse of agricultural chemicals. In the Philippines, for instance, nearly a quarter of cropland is degraded.

According to WRI projections, 40 per cent of the global population – or some 3 billion people – will live in land-short countries by 2025. In these regions there will be fewer than 0.07 hectares of fertile land per person – roughly the size of two tennis courts.

Death by breath

Population growth translates directly into more consumers of energy, more vehicles on the road, more industries and hence more urban pollution. The cumulative effects of population and income growth in the developing world and continued rise in energy consumption in industrialised countries are contributing to pollution and global climate change.

Today, over one billion people suffer from dangerously high air pollution levels, most of them in sprawling cities where industries and power plants have few, if any, pollution controls and where traffic jams are a perpetual feature of urban life. In 20 cities, most of them in the developing world, indoor and outdoor pollution is one of the leading causes of respiratory infections and premature death.

If trends continue, by 2025 close to two billion people will be living in urban areas with elevated levels of air pollution – particulates, sulphur and nitrogen dioxides, heavy metals and secondary pollutants such as ozone.

Ocean planet

Today, just over half of humanity, some 3.2 billion people, live and work within 200 kilometres of a sea coast, on just 10 per cent of the earth's land area. A full two-thirds of the world's population are found within 400 kms of a coast. Unbridled coastal development and mounting pollution loads pouring into near-shore waters have taken a grim toll on coastal ecosystems.

In the next 25 years, at least another billion people are expected to live within these coastal regions, putting pressure on coastal wetlands, seagrass beds, fisheries and beaches.

Of special concern are the 600,000 square kilometres of coral reefs, one-third of which have already been destroyed. It is estimated that within 25 years close to 60 per cent could be lost, as global warming adds coral bleaching to other pressures (see page 4).

Losing species

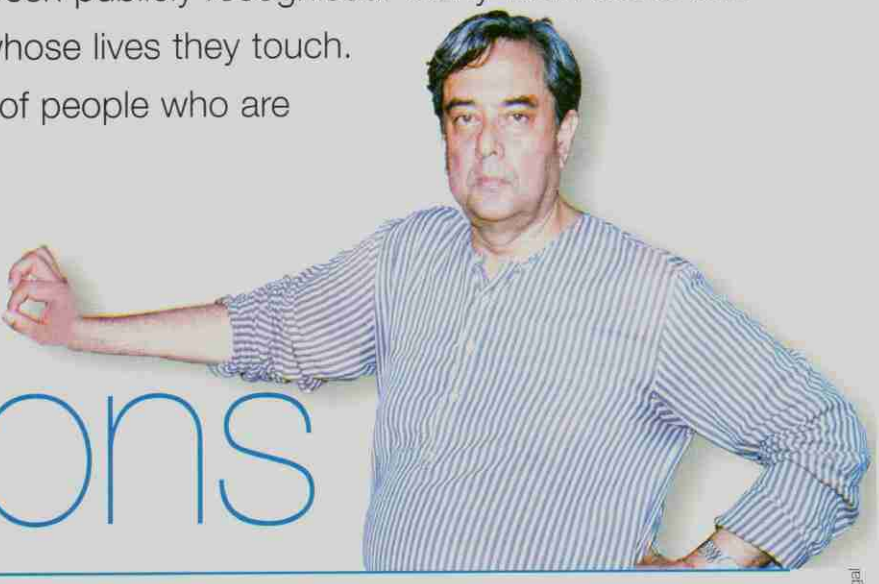
One final challenge is the unprecedented rate of habitat loss and species extinction, almost certainly the greatest such event since the mega-extinctions of the Jurassic Period, some 65 million years ago. It has been estimated that some 50,000 plant and animal species will be become extinct every year over the course of the coming decades. The loss of insects and micro-organisms is thought to be incalculable. Human-induced habitat loss and the introduction of exotic, or non-native species, has shoved the per cent of birds, mammals, fish, reptiles and amphibians threatened with extinction into double digits. Ecosystem destruction is so severe in the tropics that as many as 60,000 plant species, roughly one-quarter of the world's total, could be lost by the year 2025.

Of course, the future is always uncertain, and remains in our own hands to fashion, but the writing is on the wall. ■

Millennium trailblazers 1: **Ashok Khosla**

Many thousands of individuals and organisations are blazing the trail towards a sustainable society. Some have been publicly recognised. Many work alone and unrecognised, except by those whose lives they touch. Here we report on a just handful of people who are making a difference.

Small-scale solutions



Sunil Sehgal

Ashok Khosla set up Development Alternatives 17 years ago to help secure his vision of an India built upon intelligent application of technology. **Ritu Bhatia** reports on his achievements.

That India will become a better place to live in and its people will have their basic needs met: this is Ashok Khosla's vision for the millennium. It would indeed be considered idealistic by many. Today about 35 million people in India live in abysmal conditions. Many have no drinking water or toilets in their homes, let alone electricity or other modern amenities. Safety matches and transistor radios are virtually their only link to modern technology.

Khosla believes that India is on the brink of a millennial disaster. "Modern technology and megaprojects are destroying the nation's forests and soils, poisoning the rivers and waters and squeezing the life out of our villages and cities." One of the ways in which the situation of people's lives could be improved, he feels, is through the intelligent application of technology.

"Technology with a human face, working to build a society where people are masters, not slaves."

As the founder and president of Development Alternatives (DA), an NGO, Khosla is striving with his team to try and realise his vision and establish the kind of participative democracy he believes in: Where every person feels they are in charge of their own life.

A clear vision

DA was founded in 1982, upon Khosla's return to India after 23 years spent away. By this time he had acquired a degree in nuclear physics at Harvard and set up India's environmental policy unit, the first of its kind to be founded by the government of a developing country. He had also headed the United Nations Environment Programme in Nairobi. When he returned to his home country, his mission was clear. "I had received the best education possible, lived a privileged life, and the time had come to give back to the country, to its people..."

Development Alternatives was set up with the intent of fostering change; improving the quality of life for those denied the basics, and promoting the sustainable use of natural resources. The team at DA is of the view that the future belongs to smaller, more decentralised initiatives that involve the active participation of the people.

Village jobs

These "sustainable livelihoods", as Khosla refers to them, enable individuals or families to meet their basic needs in a manner that is dignified and does not undermine the natural resource base. "The central goal today for any developing country must be to create large numbers of sustainable livelihoods. For example, to close the unemployment gap by the year 2010 India will need to create between 12 and 15 million off-farm jobs each year."

Such micro-enterprises can usually directly create several jobs in a village or small town, each at a cost of less than $500 – one hundredth of the cost of creating jobs in large urban industries. They also permit very high returns on investment, with payback periods of less than a year.

Today a quarter of a million people have benefited from the interventions of DA. One of its most successful projects has been to improve the living conditions of the rural population of Bundelkhand, a region in the heart of India with one of the highest concentrations of fallow and uninhabited land.

Over 50 per cent of the population of Tikamgarh District, where the project site lies, were unemployed. In the Jhansi district, small farmers grew crops on only 25 per cent of cultivable land.

One of the main objectives of DA's project in this region was to set up a resource-cum-training centre. "Being an arid area with large wastelands, the people here couldn't support themselves solely on agriculture. One of our main objectives here has been to train the local villagers to run off-farm enterprises," says Geeta Vaidyanathan, senior architect at TARAGram, DA's technology complex at Orchha near Jhansi.

TARAGram today is much like an artisan's village, where people are involved in a variety of creative, income-generating enterprises. Many are landless women from nearby villages, who survived earlier on odd jobs. Now they work for a reasonable wage at the paper production unit which uses cotton rags and other bio-degradable waste to produce hand-made paper.

There are check-dams that help recharge ground water in the drought-hit zones of this district. Houses are built from low cost materials, using technologies developed by DA. "Promoting the use of appropriate technologies that recycle and reuses resources reduces the impact on the environment, and provides

people with a steady source of income and employment," stresses Vaidyanathan. Technology limited to laboratory research is not DA's goal. The real test of any technology, they believe, lies in its widespread acceptability among consumers. Khosla is of the view that technological innovations must be linked to the marketplace. Workers trained by DA staff are encouraged to eventually start up their own independent enterprises and help propagate the technology on a much wider scale. DA's role extends itself to writing a proposal for the project explaining its technological details and financial requirements, and also negotiating a loan for the entrepreneur from the local government agencies.

Sunil Sehgal

Paper and tiles

Development Alternatives is one of the biggest private producers of hand-made paper: about 5 tonnes of paper are produced every month at its plant in Delhi, and 15 tonnes from its Jhansi plant. Upmarket Indian Companies such as Shriram Industries and the Steel Authority of India and organisations such as USAID use DA's handmade paper for their stationary. Some hotels in the city print their menus and coasters on this paper and Purolator and Gabriel use it for their automobile filters.

The 'Flying Shuttle' Loom designed by DA's engineers, is now widely recognised as the most advanced handloom weaving machine available; it is as easy to operate as a traditional loom and produces as much as a powerloom. Setting up this operation creates two jobs, both within the home. Over 3,000 Flying Shuttle Looms have been sold widely in India and to several other countries.

DESI Power, another of DA's offspring, establishes village-level power stations in collaboration with village governments. It uses only renewable energy sources and supplies commercial energy to small industrial units and homes.

Another area where DA has been enormously successful has been the creation of low cost building materials. "Focusing on building materials has enabled us to generate immense employment for those in the housing sector. Most of our products use simple building techniques which can be mastered by rural entrepreneurs with a small capital," explains Khosla.

One example of DA technologies (sold under the brand name TARA) is a new roofing tile made of micro-concrete, a material free of chemicals and synthetic fibres. The TARAcrete tile, used to build sloping roofs, is a big hit in the Bundelkhand region. While its manufacture involves a sophisticated process, proper training and technical support can enable people at the village level to set up units for its manufacture.

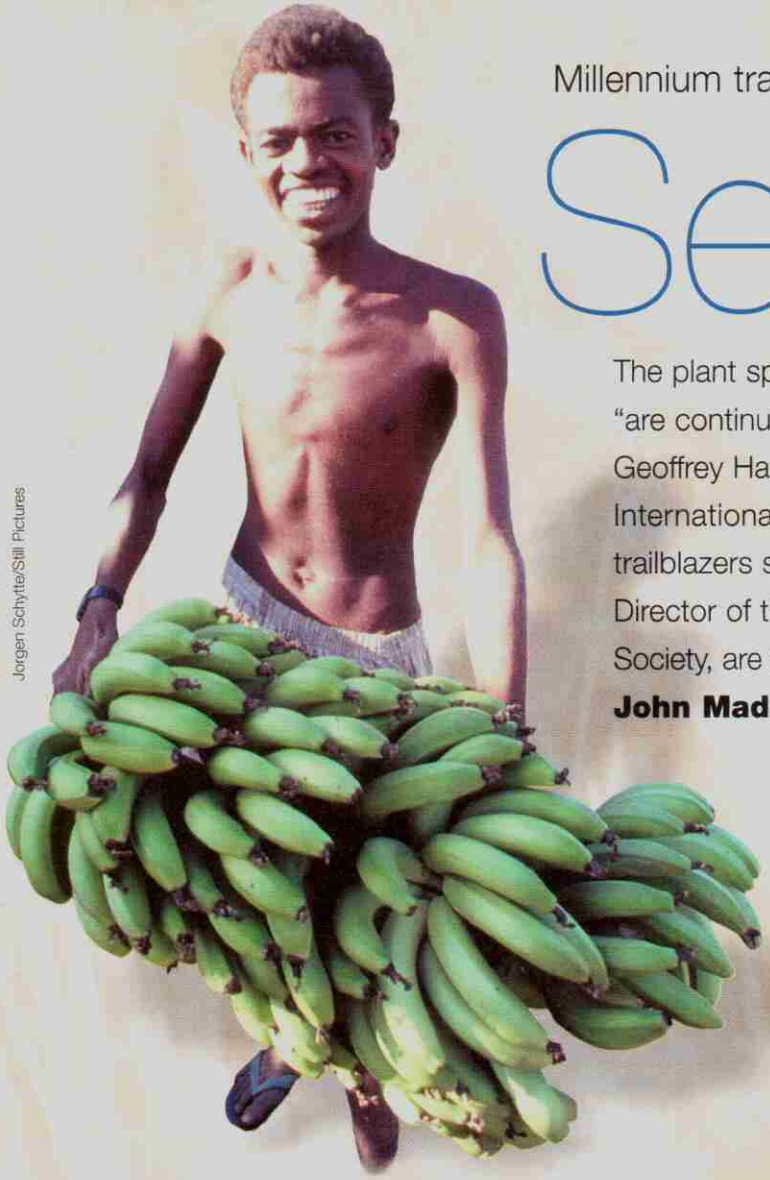
DA reaches out to a much larger population through its welfare programmes. These include a 'water for life' project where check dams are built to harvest rain water, drinking water and sanitation schemes in a cluster of villages. Another such initiative launched by DA has been its Delhi Environment Action Network (DEAN) programme, launched as a nationwide Community Led Environment Action Network (CLEAN) programme.

The DEAN programme is designed to involve children in their local environment and motivate them and others to improve the quality of their neighbourhood. Some 600 students from 12 schools spread over different parts of Delhi have been trained to monitor and assess the quality of the environment using field-testing kits developed by DA. The children presented their findings to representatives of government agencies, pollution control authorities, municipal authorities, industry associations, resident welfare associations and NGOs, with the intent of precipitating collective action.

Ultimately, Ashok Khosla admits that the dream he has of a participative democracy, which was also Mahatma Gandhi's dream, has lots of implications. "We need to abandon the centralised colonial system of government and replace it with village and district governments with exclusive jurisdiction over local matters. What follows – decentralised production systems, national government accountable to local government, self-sustaining local economies and secularism – is the only true path to empowerment of the people." ■

Ritu Bhatia is a freelance journalist with a special interest in development and health issues.

Sunil Sehgal



Jorgen Schytte/Still Pictures

Millennium trailblazers 2: **Geoffrey Hawtin and Jules**

Seeds for

The plant species on which future food supplies depend "are continuing to disappear at an alarming rate" says Geoffrey Hawtin, Director General of the Rome-based International Plant Genetic Resources Institute. But trailblazers such as Dr Hawtin at IPGRI and Jules Pretty, Director of the British-based Centre for Environment and Society, are fighting a valiant battle to reverse that trend. **John Madeley** reports.

For a quarter of a century IPGRI (and its former incarnation as the International Board for Plant Genetic Resources) has been trying to stem the loss of plant species. It is one of the 16 worldwide research stations in the Consultative Group on International Agricultural Research (CGIAR) network – and under Geoffrey Hawtin's leadership one of the most creative.

"The diversity of the Earth's plant life is under threat as never before," Dr Hawtin points out, "while extinction is a natural process, what is alarming is that owing largely to human activity, today's rate of extinction is thousands of times greater than the rate at which new species appear. This threatens the very foundations of the world's food security."

Thousands of different varieties of rice, wheat, maize and other vital crops have disappeared in recent years, and societies are becoming dependent on a narrower genetic base, and the trend continues, he warns.

"Properly managed and sustainably used, plant genetic resources for food and agriculture need not be depleted", said Dr Hawtin.

But as human populations increase, environmental problems will intensify: "climate change, deforestation, desertification and other shocks to the natural resource base could have serious consequences for crop productivity. Genetic diversity is the best protection we have against these consequences and provides a hedge against an uncertain future for the world's food supply."

IPGRI works to strengthen the conservation and use of plant genetic resources, in partnership with other organisations, undertaking research, training and the provision of scientific and technical advice and information. It is the world's largest international institute devoted to the conservation and use of plant genetic resources for food and agriculture, with over 170 staff operating from 15 offices in every continent. Funded by aid-donor governments and international agencies, its budget in 1998 was US$22 million.

Dr Hawtin has served as IPGRI's Director General for eight years. He was previously director of the Agriculture, Food and Nutrition Division of the International Development Research Centre in Canada. His career has been dedicated to using agriculture as a weapon in the war against poverty in developing countries.

"Today we find extreme poverty, in both rural and urban areas," he said, "agriculture can help to contribute to the alleviation or even eradication of poverty in both areas. By having a more productive agriculture, by diversifying enterprises, by developing farm systems that add value to materials and produce, we can develop a greater source of wealth for both city and country folk. But to do this, we need new plant varieties and new ways of growing them."

IPGRI's work is especially important now, Hawtin believes. "The world is changing rapidly," he stresses, "we're faced with issues like climate change, we're facing a rapidly growing population with increasing demands for food, we're facing shifts in the diseases and pests that are attacking these crops. For all those reasons we need new varieties

Joerg Boethling/Still Pictures

the future

Pete Addis/Environmental Images

Above: Commercial plant culture, UK. Left: Bananas, Eritrea. Banana is a vitally important crop for most developing countries. Below: Sowing rice, Karnataka, India.

that can resist these pests and diseases, varieties that can withstand changes in climate and longer periods of drought. Where are we going to find the genes needed to meet these new circumstances? We're going to find them from the huge reservoir of variability we refer to as plant genetic resources."

Humanity relies on a wide diversity of plants, Dr Hawtin points out, and at least 5000 species are cultivated for food, shelter and medicinal purposes. Agricultural research, however, has tended to focus on major staples while relatively little attention has been given to 'minor' crops.

Within the CGIAR system, IPGRI focuses on the genetic resources of importance to developing countries, encouraging them to use such resources to further their agricultural development. It has special responsibility for crops that are not covered by other international research centres – including banana and plantain, cocoa and coconut. In collaboration with the International Network for the Improvement of Banana and Plantain, IPGRI holds the world's largest collection of Musa (banana and plantain), a vitally important crop for most developing countries. It also has a forestry initiative which focuses on plant species at risk of over-exploitation.

The institute has helped countries to set up 'genebanks' – collections of plants that can be used for breeding new crop varieties – and to analyse and document their collections of plant species.

IPGRI collaborates with a wide range of institutes, and helps to improve knowledge of plant genetic resources, and of the technologies which help their improved conservation.

The institute has trained over 2000 national scientists in related disciplines, and sponsored more than 560 collecting missions, gathering around a quarter of a million plant samples. These are stored in national genebanks and also in the international agricultural research centres.

Three broad groups of people benefit from IPGRI's work, says the institute. The first and ultimate beneficiaries "are the farmers, forest dwellers and other members of the rural community in developing countries who manage plant genetic diversity in their production systems, and process and consume its products in their small businesses and households. Second, the people whose job it is to support these primary producers and processors. Third, if IPGRI's work leads to increased production of food, then urban consumers will also benefit."

Dr Hawtin says about the current controversy over genetically modified crops: "what people often don't appreciate is that genetic engineering is just one tool in the crop breeder's arsenal. But it is only one. There are many other ways in which breeders can use plant genetic resources to improve crops."

On the eve of the new millennium, IPGRI's vision remains "the harnessing of plant genetic diversity to achieve food security." But Dr Hawtin says that the sustainable use of plant genetic resources will have more emphasis in the institute's work, and that it plans to increase its forestry activities. It also plans co-operation with a broader range of partners, including botanical gardens. "And we shall also expand our work on the conservation of wild plant species, especially of food and medicinal crops," says Dr Hawtin. ■

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Background: Werner H Muller/Still Pictures

NATURE'S WAY

"Quietly, slowly and very significantly, sustainable agriculture is sweeping the farming systems of the world," believes Jules Pretty, Director of the Centre for Environment and Society at the UK's University of Essex. The centre's work is showing that higher and sustainable crop yields are possible by using few external inputs and through the integration of traditional technologies.

Jules Pretty defines sustainable agriculture as "farming that makes the best use of nature's goods and services, whilst not damaging the environment." It does this by integrating natural processes "such as nutrient cycling, nitrogen fixation, soil regeneration and pest predators into food production processes. It minimises the use of non-renewable inputs (pesticides and fertilisers) that damage the environment or harm the health of farmers or consumers. And it makes better use of the knowledge and skills of farmers, so improving their self-reliance and capacities."

The challenge for sustainable agriculture, he says, "is to maximise the use of locally-available and renewable resources." He points to impressive increases in crop outputs that are coming from this method of agriculture.

Some 223,000 farmers in southern Brazil, for example, who are using green manures and carefully integrating livestock into their system, have doubled their yields of wheat and maize. By using a range of soil and water management technologies, more than 300,000 farmers in southern and western India have tripled their sorghum and millet yields. Using regenerative technologies, around 45,000 farmers in Guatemala and Honduras have increased their yields of maize so much as to encourage re-migration back from the cities.

Some 200,000 farmers across Kenya have more than doubled their maize yields with soil and water conservation technologies. As for biotechnology, Pretty points out that "this is not currently a necessary precondition for feeding the world."

In its most recent study, the Centre for Environment and Society looked at the 45 sustainable agriculture initiatives in 17 African countries and found that some 730,000 households have substantially improved food production and household food security. In 95 per cent of the projects, cereal yields have improved by 50-100 per cent, and overall food production has increased. "The additional positive impacts on natural, social and human capital are also helping to build the assets base so as to sustain these improvements in the future," said Jules Pretty.

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Ian Brierley/Focal Point

Rainforest pioneer

For Australian forester, David Cassells, the Iwokrama Rain Forest Programme in Guyana is an experiment on which the fate of the earth's remaining rainforests could turn in the coming Millennium. **Don Gilmour** reports.

Ten years ago, the then President of Guyana, Desmond Hoyte surprised and delighted other Commonwealth heads of government meeting in Kuala Lumpur, by offering to make the Iwokrama rain forest, covering 360,000 hectares, or 2 per cent of his country, a 'Gift to the World'.

To be precise, he said this rich and pristine forest would be made available to the international community on one condition: it had to set up an international research and development centre to show other developing countries like Guyana just how they could conserve and sustainably manage their forest, while helping the long-term development of the people living in and nearby it, as well as the country as a whole.

The Commonwealth accepted the offer and with its support successive governments in Guyana have turned the concept into a reality. The Global Environmental Facility (GEF) chipped in $3 million through the UNDP, and both the Commonwealth and the International Development Research Centre in Canada provided additional funds to get the Centre off the ground.

The Iwokrama International Centre for Rain Forest Conservation and Development was formally constituted in 1996 and David Cassells, a 35-year-old Australian forester with a brilliant track record in Australia and Japan was seconded from his senior post in the World Bank Environment Department to be the first Director General. In January last year, the Commonwealth, the European Union and the World Bank jointly convened a donors meeting which netted promises of funding support in excess of $8 million from 28 countries and international organisations to start work on the operational plan.

In David Cassells' view, the focus on financial sustainability and self sufficiency is what distinguishes Iwokrama from a host of other initiatives to conserve tropical forests. And, as chairman of the Advisory Group for the World Conservation Union (IUCN) Forest Conservation Programme, he is in a good position to know.

Though the forest has a rich diversity of plants and animals, with more than 450 species of birds, 206 species of fish, 120 species of amphibians and reptiles and 105 species of mammals – including jaguars, giant river otters, harpy eagles, caiman and macaws – there are bigger reserves in quite a lot of tropical countries, he says.

"However, I don't know of any other research and development centre that has a direct responsibility for the day to day management of such a large area of forest and the challenge of becoming largely self sufficient largely from the endowment of the forest."

He plans for this revenue to come from a mixture of eco-forestry, with certified logging in a sustainable way, eco-tourism, sustainable production of non-timber products such as vines and latexes, bioprospecting, training services, and the sale of forest management expertise.

In doing this the Centre is already working closely with the local Amerindian community.

Most of the field staff are from surrounding villages, and a community environment worker is stationed in each of the 12 scattered villages to help two-way communication with local leaders, including the women's groups and village captains.

"This is fundamentally important because it means that our research has a very applied focus. Indeed, our very survival depends on us making the conservation and sustainable management of tropical forests work.

"If we succeed, there is a good chance we can change the way people everywhere value and use tropical forests. If we fail, I see little prospects for the future of tropical forests in the 21st Century being significantly different from its fate in the 20th Century – continued loss and degradation and consequent loss of biological diversity and environmental function.

"Iwokrama has forged a unique partnership for forest conservation and sustainable development. The staff of the Centre and myself will certainly be putting all our efforts to help ensure that it leaves a positive legacy for continued evolutionary possibilities for the coming millennium." ■

Dr. Don Gilmour is a forestry consultant based in Australia. He was head of IUCN's Forest Conservation Programme from 1953-1997.

Millennium trailblazers 4: **Jambi Huasi**

Taking health to the high Sierra

One of the great challenges for sustainable human development in the new century is the provision of good quality reproductive health services to people living in poor urban settlements and remote rural areas. One successful model is the Jambi Huasi – or Health House – which is flourishing among the Quechua-speaking people of the Ecuadorean Andes. **Don Hinrichsen** travelled there to research this report.

Blanca Cusin Camreudo is a 23-year-old mother of two small children, from one of the small communities who live around the mountain town of Otavalo. She has been coming to the Jambi Huasi clinic for two years. She is now anxious to space any future children and has asked for contraception in order to better plan her family.

"I like the services here," she explains in accented Spanish. "I get good advice from the doctors, the medicines are inexpensive and I can get all the services I need from under one roof."

Like other clients at the centre, Mrs Camreudo is poor. Her husband is a subsistence farmer and her neighbours mostly live on or below the poverty line. The climate here in the high Sierra has been described as "eternal spring", but many indigenous communities in these remote settlements have been bypassed by development.

Maternal and infant mortality rates are high. In some remote communities maternal mortality reaches 250 deaths per 100,000 live births, compared to the national average of 170. Similarly, in some rural areas of the Andes one in every 10 infants does not live to see his or her first birthday.

It was as part of the national strategy to address the needs of the poorest, that UNFPA's Ecuador programme financed this ground-breaking project in Otavalo to improve the scope and quality of reproductive health services for the Quecha-speaking communities.

A modest grant of $340,000 for a period of four years allowed the Jambi Huasi health clinic, established in 1994, to expand and upgrade its services, initiate an outreach programme, provide reproductive health education and information to women, men and adolescents and introduce a referral system for obstetric complications. Jambi Huasi is unique in that it provides both modern and traditional medical treatment, as well as family planning advice and services. Traditional healers use over 3,600 native plants for medicinal purposes.

The unique combination of services has made Jambi Huasi a very popular clinic. Although it was initially set up to service the needs of some 4,000 people in 10 communities around Otavalo, by 1998 close to 10,000 people were using the clinic's services on a yearly basis, some coming from as far away as 50 kms.

The comprehensive approach to reproductive health care, practised here, has attracted a lot of attention from other NGOs and the government. "Not only do we provide a full constellation of reproductive health and family planning services," points out the clinics's petite director, Dr Miryam Conejo, "but we do so in a culturally sensitive fashion, taking into account the special needs and concerns of our clients."

Jambi Huasi has a staff of 14, including two indigenous medical doctors and two community volunteers, who help with outreach. About half of Jambi Huasi's clients use the services of traditional healers. "We have delivery rooms here, as well as an examination room, a lab for blood work, a dentist's office, a pharmacy which dispenses both modern and traditional medicines, an information

Tamas Revesz

and education programme, and outreach services, which include an ambulance for bringing emergency cases to the local hospital," explains Dr Conejo.

The other stunning aspect of Jambi Huasi is that it is well on its way to being a self-sufficient operation. "Cost recovery is an important aspect for us," says Dr Conejo. "Right now client fees account for over 50 per cent of our annual income, a percentage that keeps climbing from year to year. We expect to be completely self-sustaining within six years."

"We need to expand our services and outreach to other communities," points our Dr Conejo. "Already we have an outreach service which brings our medical and educational services by van to several poor, remote mountain communities, but the needs in this region are overwhelming."

The other remarkable aspect of Jambi Huasi is that it has a full-time communication and education specialist. Dr Mercedes Muenala, who has a degree in internal medicine from the University of Quito, spends most of her time speaking to women and men in Quechua communities, in an attempt to increase awareness of reproductive health issues and to build up demand for the services provided by the clinic and its satellite operations.

Husbands too

Dr Muenala is now so popular that her public lectures are packed. And women usually bring along their husbands and children as well, making Mercedes' visits a community event. "We have managed to increase the basic knowledge of women and men regarding their fertility and how they can have safe births with healthier children," comments Dr Muenala. "Because we are not preaching fertility regulation and the use of contraceptives alone, these traditional communities are much more receptive to our messages and services."

Nevertheless, as Quechua communities learn more about reproductive health issues and how to take better care of their children and new-borns, the contraceptive prevalence rate has climbed from 10 per cent to 40 per cent in areas serviced by Jambi Huasi. "Though most Quechua women still want 4-6 children each, they now space their children and take steps to make sure they have safe, healthy pregnancies," observes Dr Muenala. As a result, both the infant and maternal mortality rates have fallen in Otovalo.

The lessons learned in Otovalo have not been lost on the government. The Ministry of Health is following the progress made by Jambi Huasi and intends to replicate this model in other under-served communities. "We are particularly interested in the cost recovery mechanisms used by Jambi Huasi," says Dr Virginia Gomez, Director of Health in the Province of Pichincha, which includes the capital of Quito. "If this model works with indigenous populations, some of whom live in remote, mountainous communities, it might also work in poor urban areas, where reproductive health services are weak or non-existent."

UNFPA's Country Representative for Ecuador, Carolyn Benbow-Ross, is following the progress made by Jambi Huasi with heightened interest. "The lessons learned from this experience are very exciting," says Benbow-Ross, sitting in her office with a view of Quito's extraordinary skyline of volcanoes, traditional buildings and quick moving clouds. "If this experience can be replicated in other indigenous communities, Ecuador can take some major steps in bringing quality, affordable reproductive health care to more of its poorer citizens, without waiting for major donor support."

The key, says Dr Conejo, is to "transform state services into community services, services that better match the needs of your target communities." This, she stresses, is one of the keys to the success of Jambi Huasi. "We transformed the way health services are offered in traditional communities by making them totally community-based. Once people perceive that they are getting the medical care they actually need, not what medical authorities are telling them they need, it is possible to make rapid and lasting improvements in the reproductive health of women and men." ■

Don Hinrichsen is a Contributing Editor of *People & the Planet.*

Don Hinrichsen

Millennium trailblazers 5:

Mobili

In October, Wangari Maathai, founder of Kenya's Green Belt Movement celebrated the first anniversary of her battle to save Karura Forest – a vital lung for Kenya's ever-expanding capital city of Nairobi. Here, she talks to **Katy Salmon** about her hopes for the new century.

"You should not be disempowered by the problems you see, you must be empowered by hope. Despite all the problems we go through, I have hope for the new millennium. We will go with a lot of baggage from this century but there is hope and tomorrow seems like it is possible."

Sitting in her 'office', the leafy garden of the Green Belt Movement (GBM), Wangari Maathai points to the trees above her head: "I use trees as a sign of hope. They are alive. They keep going, don't give up. There is hope in the environmental movement. You can do something positive for change, set out to work, plant trees, dig trenches – not just complain."

Professor Maathai, a fearless and outspoken environmental campaigner, has been clobbered by baton-wielding riot police, threatened with female circumcision and told she has no moral grounds to speak because she is a divorcee. And all she wants to do is plant trees.

Land-grabbers

Her high-profile campaign to save Karura Forest – a vital lung for Kenya's ever-expanding capital – from 'land-grabbing' has brought her into head-on confrontation with the government. In deals that have shocked the nation, this public land has been allocated to private developers, eager to line their own pockets by looting the nation's heritage. Government files listing the names of companies allocated plots in Karura have mysteriously disappeared.

In January 1999, Nairobi erupted into three days of riots after thousands of protesters, who marched to Karura to plant trees, were beaten and tear gassed by riot police and General Service Unit personnel. Pictures of blood-soaked students were beamed around the world, leading international figures, such as United Nations Secretary General Kofi Annan, to speak out in Maathai's defence.

Wangari Maathai

sing the mothers

"With a leadership that is so corrupt, it is difficult to protect the environment," says Maathai. "People tend to think forests are government property and the government takes advantage of their ignorance. We emphasise they are public goods for the common good, for now and for the future.

"By howling and yelling, we've really raised it to the national level. People have started understanding forests don't belong to governments. Local people – architects, bankers, lawyers – don't want to be involved in the destruction of Karura. By making noise, you make the land useless."

This is not the first time Maathai has taken on the government. In 1989, she shamed international investors, including Robert Maxwell, into pulling out from building a 60-storey office block on Uhuru Park, the only green area in Nairobi's congested city centre. Maathai's ability to mobilise international support was crucial to her success: "We told our colleagues internationally: 'Check if your government is involved. Why would you want to destroy a small park in Nairobi when no one would touch Central Park?'"

Tree nurseries

Her efforts to save the park unleashed a barrage of personal insults, focusing on the failure of her marriage. One MP said he would circumcise her if she set foot in his district. Government ministers dismissed her as "bogus" and "a tribalist". Maathai says she is unfazed by such abuse, although she admits: "Of course, they don't do your psyche any good. If you attack a woman by attacking her womanhood, she'll feel embarrassed and violated. You're human, you don't want to be humiliated. They hope you will be so hurt you will not raise your voice again. The real objective is to stop you talking. 'Are you going to give in or what?' And for me, never."

Instead, she plays them at their own game: "Last time, I told another MP: 'I'm sick and tired of men who are so incompetent that every time they feel the heat because women are challenging them, they have to check their genitalia to reassure themselves. I'm not interested in that part of the anatomy. The issues I'm dealing with require the utilisation of what's above the neck. If you don't have anything there, leave me alone.' He didn't say another word."

Maathai makes a formidable opponent. She first hit the headlines in 1971 as the first woman in East and Central Africa to get a PhD, later becoming the first female associate professor at the University of Nairobi and chair of the National Council of Women of Kenya. Her GBM, founded in 1977, has started over 3,000 tree nurseries, produced 20 million trees and involved 50,000 women. In recognition of her achievements, Maathai was presented with the Woman of the World award by Princess Diana. She also sits on the UN Disarmament Advisory Board.

Before becoming involved in the fight against land-grabbing, the GBM devoted its energies to planting trees. "As a biologist, I saw a lot of environmental degradation and soil erosion and I met poor women needing firewood and fencing materials," explains Maathai. So she set about training women to establish their own tree nurseries: "We make them independent people who can take care of their environment by themselves."

The project has been phenomenally successful: "In these 20 years we have created a great green consciousness and raised awareness," she says. "In rural areas women are very proud to show us their work. They feel empowered and appreciate the physical change of environment. They talk about the returning of birds and hares. There has been a profound transformation in how they look at the environment. They have made planting trees a culture. I call them foresters without diplomas." Her vision is now spreading across the continent via the PanAfrique Greenbelt Project, sponsored by Comic Relief, which brings together environmentalists from all over Africa so that they can learn from one another.

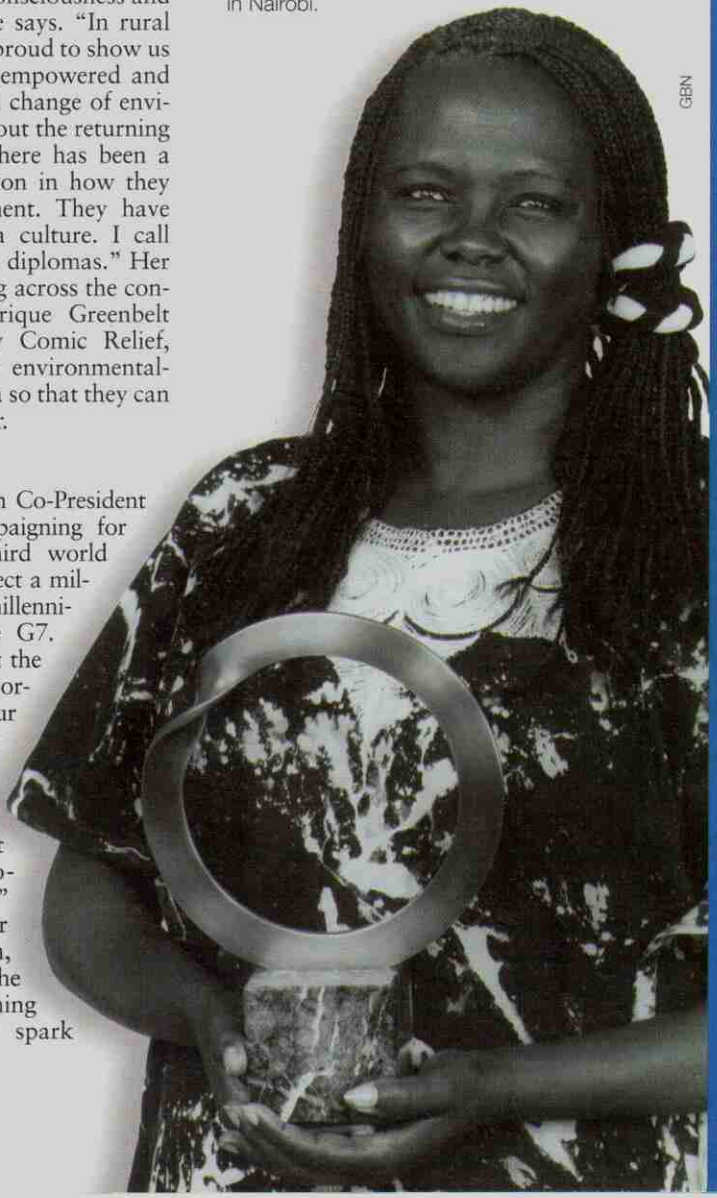
Fighting ignorance

Maathai is also African Co-President of Jubilee 2000, campaigning for the cancellation of third world debt. She hopes to collect a million signatures by the millennium to present to the G7. "The main thing is not the signatures. What is important is to educate our people as to how these debts came about and connect it with good governance," she says. She is an ardent supporter of the "pro-democracy movement" whose campaign for a new constitution, primarily to reduce the President's overwhelming powers, continues to spark passionate debate.

The importance of civic education is one of her favourite themes: "I have been trying to fight ignorance. People become very vulnerable when they do not receive information. They are marginalised by their own government. Because of ignorance and poverty, they do things that are against their own interests. Politicians can buy poor voters."

The 59-year-old grandmother shows no signs of fatigue: "I have invested 20 years of my life in this campaign for the environment and I'm still only scratching the surface." On 7 October 1999, she celebrated the first anniversary of the battle to save Karura: "I am confident of winning. The government is determined. So are we. They are hoping we shall tire but we are not going to tire. It doesn't matter how long it takes. Nobody will build anything there as long as we live. We cannot dignify theft."■

Katy Salmon is a freelance journalist based in Nairobi.

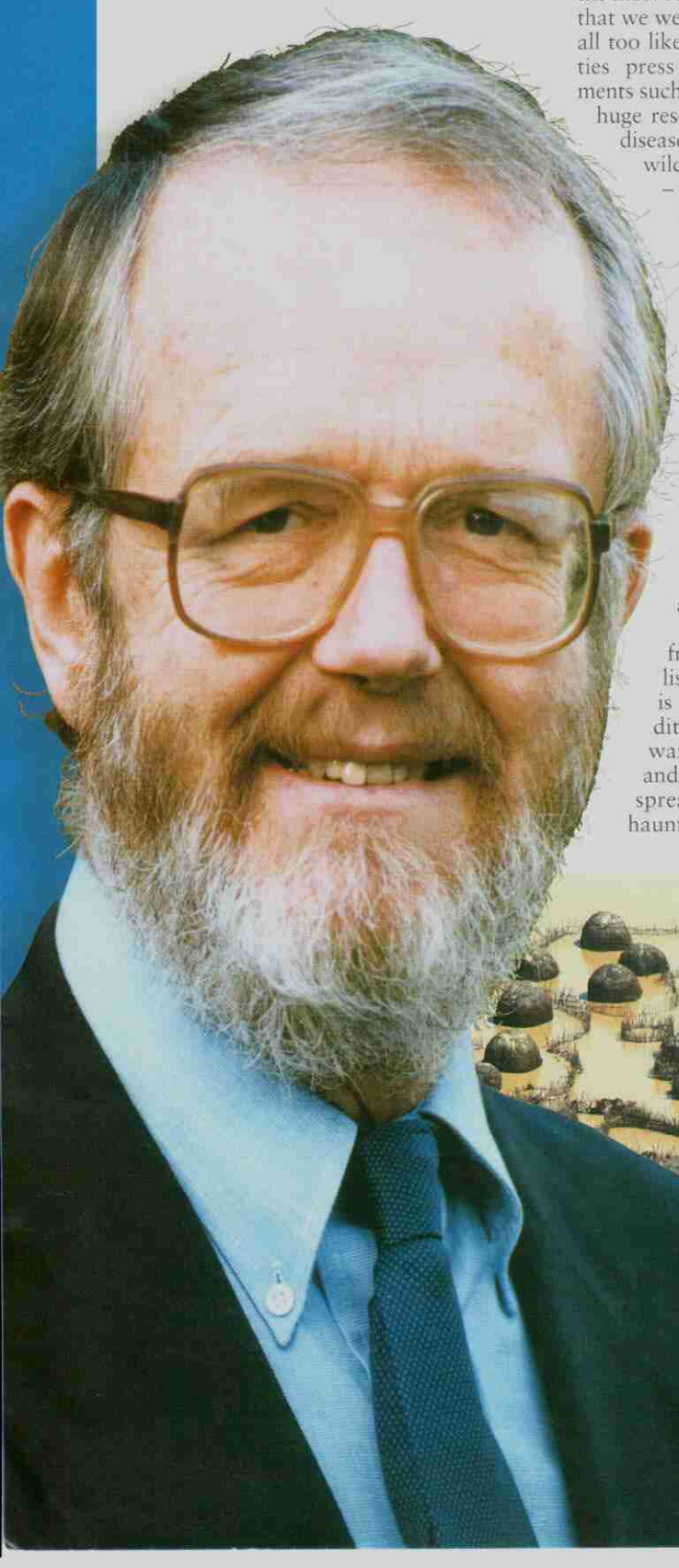


GBN

Scenarios for the future 1: **Norman Myers**

Heaven forbid

There is no shortage of possibilities for a downside scenario in the coming century. Consider these candidates – and reader, if you have ever sported a doomster and gloomster's hat yourself, you will have plenty of ideas of your own.



First, we face a world of new diseases: the most surprising thing about AIDS is that we were surprised by it. Surely it is all too likely that as human communities press ever-deeper into environments such as tropical forests with their huge reservoirs of pathogens, a new disease will make the leap from a wild creature into a human host – whereupon it will find itself in a bacterium's paradise, with humans roaming across horizons far and wide.

Not only has AIDS reared its fearful head, but a series of others: Lyme disease, Ebola, Legionnaire's disease, the Hanta virus and a couple of dozen others – just for starters. What others are lurking "out there", awaiting their chance? Who would bet against one pandemic disease after another after another?

A parallel threat stems from fresh outbreaks of established diseases. Tuberculosis is proving resistant to our traditional therapies. Global warming will enable malaria and other tropical scourges to spread beyond their usual haunts, and when they attack human communities in, say, southern Europe, they will encounter "targets" that have long lost any residual resistance they once had.

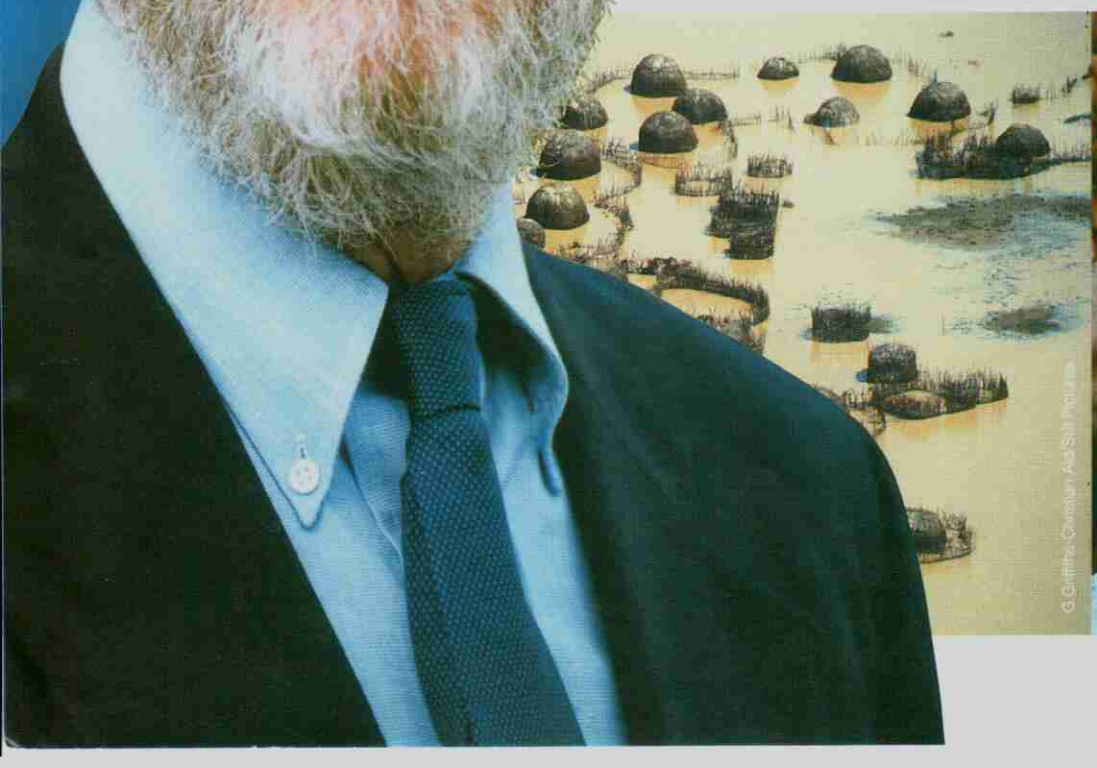
Stormy weather

Then there is the weather. In 1998 there were more and fiercer storms, droughts, floods and the like than ever before. Economic costs of weather-related natural disasters have been soaring and in 1998 were greater than in all the 1980s put together. Should we not anticipate that these weather disasters will continue to proliferate?

What chance, for instance, that during the hurricane season in the Caribbean, a storm will not bypass Miami (one at least has come close already) but will actually strike the city?

Not unrelated to such disasters is the growing army of environmental refugees. Their numbers have grown so fast during the past two decades that the total today, 25 million (minimum estimate), exceeds that of all ethnic, political and religious refugees put together.

Could the future hold the prospect that their numbers will swell to such large levels, and their sense of desperation will run out of toleration, until we witness masses of destitutes trying to flee, for example, from North Africa into Europe? It is a short journey from Morocco to Spain or from Tunisia to Sicily.



If anyone doubts this is a realistic prognosis, check with the Spanish and Italian governments: they are deeply concerned already. What prospect too of an eventual influx of refugees from Southeast Asia into northern Australia – or even from China into "empty" Siberia?

Jump effects

We should anticipate that these environmental discontinuities, aka non-linearities, will become prominent in the future. The classic illustration is when liquid water changes to ice or steam. These sudden environmental shifts have the capacity to be profoundly disruptive of ecological processes, and to catch us unawares by overwhelming our preventive capacities. In other words, the worst environmental problems ahead will often be the ones we have scarcely thought of.

Such 'jump effects' occur when ecosystems absorb stress over long periods without much outward sign of damage, but eventually are pushed to the limits of their resilience. They reach a disruption level at which the cumulative consequences of stress finally reveal themselves through systemic change of critical scale.

Familiar instances are acid rain and ozone-layer depletion. Other examples include bleaching of coral reefs; mass mortality of dolphins and seals; phytoplankton blooms; cancer epizootics in fish; and declines among amphibians worldwide, Peru's anchoveta, *saguaro cactuses* in the southwestern United States and northern Mexico, and birds migrating between the United States and Central and South America and between Europe and Africa.

All these examples share several characteristics. First, they cover hundreds or thousands (occasionally tens or even hundreds of thousands) of square kilometres, so they can be regarded as regional or even global phenomena. Second, they are unprecedented in our scientific experience and ecological understanding. Third, there is no obvious explanation, although a primary culprit often appears to be pollution. Fourth, we know next to nothing about what these perturbations reveal concerning further such phenomena engendered by growing pollution and its 'chemical time bombs'. What we do know is that they presumably amount to a whole flock of miner's canaries singing with decibels of warnings.

As we witness ever-more growth in human numbers and activities, we can expect there will be a rapid increase in such discontinuities with their grossly disruptive impacts. Yet for the most part they remain black holes of research.

Greenhouse genie

Finally there is the runaway greenhouse effect. This is surely the biggest potential discontinuity of all. There is stacks of scope for it. As global warming takes hold, it will cause the boreal forests to dry out and die away in extensive tracts, as well as be consumed by an increase in wild fires (as is already happening along the southern fringe of Canada's forests and in Siberia). This will release a huge additional pulse of carbon dioxide into the global atmosphere, thus aggravating the original global warming processes. Other biotas will start to desiccate, further reinforcing carbon dioxide emissions. At the same time, there will be large methane releases from peat deposits along the northern fringe of boreal forests.

These combined processes will accelerate global warming overall through their mutually compounding impacts. Were governments to finally decide they wanted to curb global warming, they could conceivably find they were too late. The genie could not be pushed back into the bottle, and we would be stuck with a runaway process.

Equally on the cards and alarming is the prospect that global warming and ozone-layer depletion will serve to boost each other. Whereas global warming will heat up things at the Earth's surface, it will cool them up in the stratosphere – and this will, for complex reasons of atmospheric chemistry, worsen the depletion of the ozone layer. Meanwhile ozone-layer depletion will have allowed an enhanced amount of UV-B radiation to reach the Earth's surface, where it will have struck hard at those organisms most susceptible to radiation injury, the phytoplankton in the upper ocean layer.

It is the phytoplankton that do much to regulate the global carbon budget by absorbing some 40 per cent of all CO_2 emissions from human activities. Were the phytoplankton populations to decrease, there would be less absorption of CO_2, more global warming, more cooling of the upper atmosphere, more ozone-layer depletion – and so on with an ever-tightening process.

Neither of these global warming scenarios is likely. In fact both are extremely unlikely. But given the extremely downside repercussions of a runaway greenhouse effect, can we afford to ignore a future with a probability greater than zero?

These, then, are some possibilities for a world going off the environmental rails with a vengeance. The risk of their coming to pass varies from substantial to slight. Either way, the costs could be exceptionally large and long lasting. The better news is that none of them need overtake us. All we need to do is decide that we don't want them, to cut them off still-born.

That's all. Or will that "all" prove too much for us?

Dr Norman Myers is a Fellow of Green College, Oxford, and a Contributing Editor of *People & the Planet*.

Scenarios for the future 2: **Jeffrey McNeely**

A golden age

It is a great pleasure to write an article about a hopeful future, as a sort of antidote to the gloom and doom that we read every day in the newspapers and hear every evening on the televised news. But a cold and objective assessment of the potentials and possibilities of our own species can indeed inspire considerable optimism for the future. For while things can still fall apart, the centre can hold if we make the proper policy decisions as we progress into the future. Here are just a few of the positive trends that can contribute to a Golden Age.

Let's start with the hardware. The 20th century has been a century of physics and chemistry, following the conceptual breakthrough of the Periodic Table of the Elements in the second half of the 19th century. But just as machines and chemicals dominated the 20th century, biology will be the driving force of the Golden Age.

The mapping of the human genome may be a conceptual breakthrough comparable to the Periodic Table. Combined with better scientific understanding of how biological systems work, the new biotechnology will enable us in the fairly near future to enable people to live a longer and healthier life, and produce local varieties of agricultural plants custom designed to local conditions.

New plants

On the agricultural side, a new generation of plants will be designed to produce their own nutrients and their own compounds to protect themselves against pests, thereby radically reducing the need for fertilisers and pesticides, and freeing farmers of their dependence on distant factories. Instead of depending on chemistry, with its poisonous side-effects, Golden Age agriculture will depend on biology, a science of renewal and recycling.

The new plants will contain oils that are healthier for the heart, tastier, more nutritious, and easier to digest. Some will carry high levels of substances that fight cancer and other chronic human diseases.

In the Golden Age, different communities will have very different diets, tuned to their own agricultural growing conditions and cultural preferences. But generally speaking, people will have moved lower down the food chain and will be gaining more of their nutrients from the highly productive agriculture that enables many crops to be grown and to meet all dietary needs. Meat will still be an important part of the diet in pastoral and fishing communities, but a relatively minor part in most agricultural communities.

Golden Age factories, too, will be increasingly biological. Biotechnology will be used to convert wastes into useful products, and industries will be using new generations of plastics grown from plants, making them easily biodegradable, and using bacteria to make new polyester fabrics that are far superior to similar fabrics made by petrochemicals. Speciality chemicals and novel biopolymers will be grown biologically on an industrial scale far more cheaply than any current processes.

Energy sources

More effective local production systems and improved electronic communications will have greatly reduced the need for fossil fuels as sources of energy. Instead, a new generation of renewable energy sources will have been developed, often at a local scale rather than a national one. Thus local communities take in greater control of their energy sources, tuning their demands to sustainable sources of supply.

Because energy sources are renewable, the flow of critical nutrients such as nitrogen and carbon is much more circular, so the climate changes driven by excess carbon dioxide and other greenhouse gases in the atmosphere will be reversed and the climate will now be subject only to seasonal and cyclical vagaries driven by changes in solar activity. Similarly, because ozone-depleting chemicals are no longer being produced, the ozone layer will recover and the atmosphere will now be optimal for human welfare.

On the human health front, improved diets based on organically-grown crops will mean fewer health problems, but when things do go wrong, far more effective remedies will be available, ranging from edible vaccines grown by plants to new organs that can be grown in special medical facilities. Particularly useful will be edible vaccines that protect children against diarrhoea, the major cause of infant mortality in most developing countries.

Toby Adamson/Environmental Images

The breathtaking pace of innovation in electronics, leading to new generations of computers that are smaller, smarter, and cheaper, will soon make virtually any information freely available to virtually anyone who wants it. While it is possible to give everyone anywhere a superfast connection to any kind of information, from films to books, from news to business and shopping data, most people are far more interested in their own cultural identity, using the new technologies to better explore their local environments.

But while the current generation of information technology is fuelling globalisation, the Golden Age will see a very different trend, as information will be custom-designed to be relevant to the particular settings in which it is needed. Thus instead of reducing diversity, the next generation of information technology will promote greater cultural diversity while enabling people to be better adapted to their local environmental conditions.

The software

The technology of the Golden Age will bring about profound social changes. With people living longer and healthier lives and infant mortality reduced to very low levels, human populations will stabilise and even start to decline (as they already have in several European countries).

People will be able to live much richer lives, both spiritually and intellectually. Leisure time will be devoted to perpetual education, enabling people to become ever better adapted to their local conditions while enabling them to participate far more actively in many more interactions.

As demographic curves begin to flatten out, relations between the generations will become ever more respectful. And the more educated people become, the more inevitable become democratic forms of government that are more responsive to the needs of local people.

Further, because populations have stabilised and systems for producing food and other necessities of life have become more efficient, people no longer need to compete with wildlife for their habitat needs. On the contrary, in the Golden Age the great diversity of life is celebrated, and ample areas are available to support the full richness of life on our planet.

Because more can be produced on less land, more territory is available for other species. Land marginal for agriculture has been returned to more natural types of ecosystems. Areas devoted to conserving biodiversity are popular vacation destinations for people celebrating the richness of life.

With greater democracy and more local self-reliance, the nation states that characterise the 20th century are no longer viable in the Golden Age. While some regional groupings may be needed for some purposes, most governance is at the local level, reflecting local social and cultural imperatives, often linked with the primary sources of productive labour.

The rapid decline in languages has been reversed, and virtually all of the world's 6,000 languages are in active use, again reflecting the value of diversity in the Golden Age.

Because life in rural areas is improving and communications enable virtual offices to be established anywhere, cities no longer have their historical attraction as sources of intellectual stimulation. Thus the human population becomes more evenly spread, with fewer large cities and more small cities and towns that develop distinctive characters appropriate for their settings.

What it will take

Golden Age technology enables people to meet their basic needs through local production, so the historical conflicts between neighbouring cultures is greatly reduced, and people see little justification for conflict. Democratic systems of government are so widespread that despots are unable to find the chaotic conditions they need to flourish, so a new era of good feeling spreads over our planet.

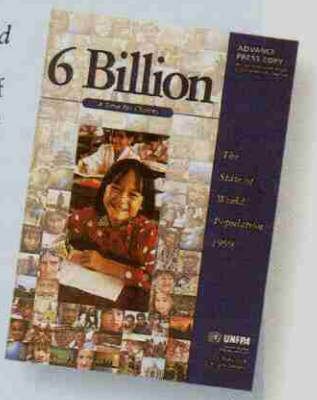
All of this may simply be starry-eyed optimism. But the technologies I have described are all already on the drawing board or under development. Our biggest challenge lies not in the technology, but rather in the human software – our ability to enable people everywhere to determine for themselves the kinds of lives they would like to lead.

Finding the Golden Age depends on social and political advances, requiring much greater tolerance of diversity and a generalised encouragement of human rights. Clearly, if we wish to reach a Golden Age, we need to maintain the greatest possible biological and cultural diversity, enabling people to live in balance with their environmental resources and adapting to the local conditions within which they live. ■

Jeffrey A. McNeely is Chief Scientist at the World Conservation Union (IUCN).

Associates' news

DIVERGING TRENDS



More than in any other year, population trends are diverse and diverging, says *The State of World Population 1999*, published by the UNFPA to mark the birth of the sixth billion baby in October.

While 61 countries are now seeing fertility at or below replacement level, with the prospect of population declines, numbers are continuing to grow fastest in the poorer countries, especially in sub-Saharan Africa and South Asia. These are also the countries least able to meet the basic needs of the people.

"The rising number of poor people in poor countries is a rebuke to everyone concerned about social justice, the environment and development" says the report. "Rapid population growth is only one among many concerns," it adds "but it contributes to environmental damage, pressure on land and water resources and political instability."

It says the cumulative effects of continuing poverty, malnutrition and ill health, gender discrimination and inequities in key areas such as health and education; new threats such as HIV/AIDs; environmental change; and shrinking international resources for development "have a potential to wipe out the benefits of lower fertility over the past generation, with global consequences."

International assistance for population and reproductive health is running at less than $2 billion it reports – far short of the $5.7 billion pledged for the year 2000, at the Cairo Conference on Population and Development in 1994.

Calling for decisive action to implement the Cairo agenda and to expand the resources to do so, the report concludes that "The decisions taken in the next decade will determine how fast the world adds the next billion people and the billion after that, whether the new billions will be born to lives of poverty and deprivation, whether equality will be established between men and women, and what effect population growth will have on natural resources and the environment."

The State of World Population 1999, published by the UNFPA, 220 East 42nd Street, New York, NY 10017, USA

POLLUTION SOLUTION

A comprehensive new study by WWF and the Tellus Institute shows that the United States could reduce the pollution that leads to global warming and at the same time spur substantial domestic job and economic growth.

The report, *America's Global Warming Solutions*, shows how a mix of financial incentives, regulatory changes and market measures to promote efficient and non-polluting technologies could save the US as much as $43 billion per year on energy costs, and create more than 870,000 new jobs by 2010.

Applying these policies could also ensure that the US reduce its emissions by 14 per cent below 1990 levels, twice the amount specified in the 1997 Kyoto climate treaty. A further consequence would be substantial reductions in other air pollutants harmful to human health.

The United States currently accounts for half of all carbon dioxide emissions by western industrialised countries.

Contact: Jennifer Morgan, Tel: (+1 202) 778 9514, Fax: (+1 202) 331 2391, Email: climate.campaign@wwfus.org

See the WWF-US website at: http://www.worldwildlife.org/climate/wwf_solution.htm

www.ippf.org

The International Planned Parenthood Federation (IPPF) has launched more than 160 Country Profiles on its website – a one-stop site for sexual and reproductive health information.

Each country profile provides general country background, the sexual and reproductive health context, details of national Family Planning Association – including activities and contacts – and socio-demographic statistics such as population levels, fertility, contraception and mortality rates, as well as health, education and employment indicators.

An interactive on-line guide for young people, *Mezzo*, is also featured on the 1,000 page website.

Visit the country profiles at: http://www.ippf.org/regions/countries

IPPF

• Min Min Lama, the young Nepalese girl featured in last issue's Associates' News, was released from prison in September where she was serving a 20-year sentence for having an abortion after she was raped. The Family Planning Association of Nepal (FPAN) has assumed responsibility for her care and custody. Her release from jail follows a successful campaign by IPPF, FPAN and other agencies.

FOREST HOTSPOT

In an effort to stem forest loss in the Mediterranean basin, the World Wide Fund for Nature launched the Mediterranean phase of its European Forest Hot Spots Campaign in Rome in July.

This aims to establish a network of protected areas covering at least 10 per cent of the region's forest by 2005. WWF has identified the most important and representative forest areas that need immediate protection in the Mediterranean region and will particularly focus on ten of these 'hotspots'. It urged national governments represented within the Mediterranean Commission for Sustainable Development to take adequate measures to create new types of protection for forests, namely 'Green Belts' against desertification and 'Forest Reserves for Water Conservation'. It also encouraged governments to develop incentives to help local communities to benefit from forest conservation.

"Any plan for sustainable development in the Mediterranean region must be based on protection of the forests of highest biological value," said Pedro Regato, WWF Mediterranean Forest Officer. "WWF urges all governments to save 'hotspots' in the region and improve legislation not only for the sake of biodiversity, but also for our drinking water, soil, air and future generations."

Contact: Alessandra Poggiani, Head of Communications and External Relations, WWF Mediterranean Programme Office. Tel: (+39 06) 84497424, Email: apoggiani@wwfnet.org

NATIONAL PARK THREAT

Government plans in Pakistan to allow the Kirthar National Park to be opened up to oil and gas exploration are being strongly resisted by the World Conservation Union (IUCN).

In a rare move, IUCN has declined to sit on a governmental panel formed to propose changes in the existing laws covering the seismological survey of the protected park. Asserting that IUCN could not become party to the destruction of a national park, Nargis Alvi Head of IUCN's Karachi office said that "the proposed committee should have been a body to look after the conservation aspects and safeguard the rights of the local inhabitants, and not visa versa."

Located over 150 kilometres north-east of Karachi in the Sindh Province, the Kirthar National Park covers 3,000 square kilometres and has a rich variety of plants and animals, including Urial sheep, ibex and chinkara gazelle. Jungle cats, desert cats and even the occasional leopard and desert wolf also prowl the park. Pangolins (scaly anteaters), porcupines and monitor lizards are more in evidence.

In spite of protests from the Sindh Wildlife Department and local conservationists, Pakistan's ministry of Petroleum and Natural Resources has given Premier Oil Exploration, Lasmo Oil and Shell Exploration a license to explore for oil and gas. The exploration is to take place in the Dumbar Block, which forms 95 per cent of the area of the park.

IUCN's decision to opt out of the controversial body will set back the efforts of the government's law department to modify the existing rules.

Source: Environmental News Service (ENS), June 1999.

INDIA'S BILLION

As India passes the one billion milestone (with the exact date varying from August 15, 1999 according to the United Nations, to May 11, 2000 according to the Indian Health Ministry) hopes for eventual population stabilisation now rest in part on the success of efforts to replace family planning target-chasing with a wider concern for reproductive health.

The issues involved and the evidence of progress are reported on in a new book published by the Population Council and edited by Saroj Pachauri, regional director of the Council for South and East Asia. More than two dozen scholars and practitioners have contributed to this book which looks at the fertility transition in India and at the changes in approach to family planning, reproductive health and gender issues.

Dr Pachauri says the shift in approach has mind boggling implications. "It calls for a change from a top-down, male-dominated, bureaucratic,

Jimmy Holmes/Environmental Images

target-driven programme to client-friendly, gender-sensitive services that respond to people's needs." But, she adds, the biggest change in policy has been overcome, and there is no turning back.

In the meantime, *The Guardian* reports, India faces the new century with 390 million of the world's poorest people, living on less than 2,444 rupees (£34) a year, the largest population unable to read or write (mainly women) in the world, or some 465 million, with some 700 million living in homes without lavatories. Unfortunately, the newspaper adds, the Indian government spends only 2 per cent of its budget on education and 0.7 per cent on health, including family planning.[1]

One copy of *Implementing a Reproductive Health Agenda in India: the Beginning* is available free (except $5 mailing costs) to qualified individuals and institutions in developing countries from:
Population Council Regional Office,
Zone 5A, Ground Floor, India Habitat Centre,
Lodi Road, New Delhi 110 003, India.
Tel: (+91 11) 464 2901,
Fax: (+91 11) 464 2903,
Email:nangia@pcindia.org

1.*The Guardian*, London, August 14. 1999.

FORESTS AND PEOPLE

Nearly one in three people – or 1.7 billion – live in countries with critically low levels of forest cover, according to a new study by Population Action International (PAI). "And if current rates of deforestation continue this figure could nearly triple to 4.6 billion people by 2025."

Asia and Africa are the areas at greatest risk of future forest resource scarcity, according to the report entitled *Forest Futures: Population, Consumption and Wood Resources.*

Among other key findings, the study reports that:

- Forest scarcity threatens the availability of paper for education.
- Over half the wood harvested each year is burned for fuel, with severe shortages of fuelwood in Central America, sub-Saharan Africa and parts of Asia.
- The numbers of people living in countries with scarcity of forest and freshwater resources is expected to increase from 250 million to 800 million, in 26 countries, by 2025.
- Loss of forests threatens biodiversity, including life saving medicinal plants.

The report assesses for the first time forest resource availability for 157 countries and charts the area of forest cover available to each person in each country between 1995 and 2025.

Despite the disturbing trends it envisions a positive future that sound population and conservation policies could bring about for forests and those who depend on them.

Forest Futures is available from:
PAI,1120 19th Street, NW, Suite 550,
Washington DC 20036.
Tel: (+1 202) 659 1833
Fax: (+1 202) 293 1795
or on the PAI website at: http://www.populationaction.org/whypop/forest_index.htm

Associates' News is compiled by **Maya Pastakia**

LETTER: SWADDLED BABIES

I was concerned to see the picture of swaddled babies, tied up into packages, in a recent issue of your magazine (Vol 8/1). This damaging traditional practice still exists in remote areas of Russia and Asia, but has been strongly opposed by international midwifery groups and organisations, including the World Health Organisation. I do hope that Planet 21 will join in the campaign against this practice.

Fran P. Hosken
Editor, *WIN News*

Films

MILLENNIUM FILMS

Television Trust for the Environment (TVE) has joined forces with Intermediate Technology to produce *Hands On*, a series of 60 short television features that are spreading the message that development *can* enhance the environment – and bring independence and better incomes for the poor into the bargain.

From transport to sanitation, food to forestry, energy to agriculture, housing to micro-credit, *Hands On* features a massive range of sustainable enterprise and appropriate technology from all corners of the world, North and South.

But the aim of *Hands On* was always more than a television series about interesting and innovative sustainable technologies. The intention was to provide anyone who wanted it, with the detailed information, plans and technical guidance to set up and run, any of the ideas featured. So a key component has been the multimedia backup: radio, web and printed information – and a dedicated technical enquiries unit run by Intermediate Technology.

TVE is now producing a second series of 12 half-hour episodes of *Hands On* which will be broadcast from January 2000 on BBC World. Themes include energy, transport, water, sanitation and natural resources. So if you want to put up a wind pump, find out about electric cars, start a fish farm, build a school, or any number of other sustainable initiatives now you know where to turn to.

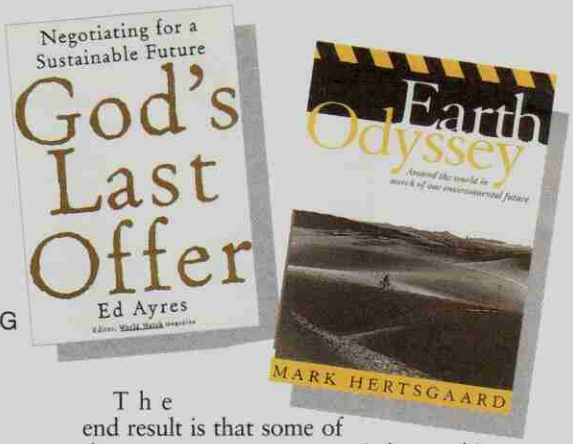
Nick Rance

For further details of *Hands On* and other TVE programmes on environment and development issues contact the Distribution Office, TVE, Prince Albert Road, London NW1 4RZ, UK. Tel: +44(0)171 586 5526, Fax: +44(0)171 586 4866, Email: tve-dist@tve.org.uk

Or look at the *Hands On* information on the TVE website: http://www.tve.org

- Also now available is an excellent catalogue, African Films and Videos, on social/health issues such as AIDS, women's rights and teenage pregnancy. The catalogue is available free and there is a special discount offer – every other video you buy is half price. Contact: Development Through Self-Reliance, 6679-P Santa Barbara Road, Elkridge, MD 21075, USA. Tel: (+1 410) 579 4508, Fax: (+1 410) 579 8412, Email: dsr@dsr-inc.com Website: http://www.catalog.com/dsr/film.htm

Books



COMFORTABLY NUMB?

GOD'S LAST OFFER: NEGOTIATING FOR A SUSTAINABLE FUTURE
Ed Ayres
Four Walls Eight Windows, New York/London, 1999, US$22/£14.99

Ed Ayres is a worried man. Editor of *World Watch* since 1993, Ayres has all the alarming facts about the declining state of the planet at his fingertips. But it is not the fires raging across the rainforests, the destructive floods in China and Bangladesh or the acceleration of global warming that bothers him most. His real concern is "the tragic complacency" that continues to blank out these warning signs and block serious reforms, particularly in his home, the USA.

The roots of this ecological blindness are many and complex. The rearguard actions of vested interests explains much of the inertia, according to Ayres. Here, the classic case is climate change, and the role of the business lobby group, the Global Climate Coalition in preventing effective action in the United States. Because of the tight financial links between the fossil fuel industry and the US political establishment, taking tough action on climate change would be "political suicide".

Ayres plots how corporate PR managers deflect the need for change by creating false extremes, so positioning the status quo as the voice of reason and moderation. Contrarian messages – such as "global warming is a myth" – which deny the need for change are also favoured by a media whose interests are skewed by ownership patterns.

Yet, there is also the sheer problem of normality, and the way in which pathologically excessive levels of consumption are still viewed as signs of a healthy economy. When this pattern of normality is challenged, "there's always a ready market for denial" says Ayres. Moreover, the media continues to portray the rising curve of environmental disasters as sensational and transitory events, unconnected from each other or from the need for change in underlying lifestyles and business practices. Huge amounts of information are also kept from the public sphere.

Beyond the resistance of corporate and media interests lie new problems that obstruct our ability to act, notably a sense of disorientation brought on by accelerating change in all aspects of our lives. Once stable conditions are now becoming undermined by a new range of threats to security. Our capacity to understand the systemic roots of the current crisis is also weakened by the fragmentation of knowledge brought on by specialisation. Culturally, people's conection with environmental change is becoming more and more tenuous, as the maincontent of consciousness becomes the virtual world of entertainment and celebrity.

The end result is that some of the most momentous events in human history are being pushed to the margins of public consciousness. Ayres portrays four 'spikes' whose rapid growth is threatening a liveable future: unchecked growth in greenhouse emissions, unprecedented levels of species extinction, uncontrolled resource consumption and continuing population growth.

For Ayres, the challenge facing the US and the wider world is almost religious: "God has given us an offer: to see the consequences of our actions and assume moral responsibility for them, or to be consumed by them." Ayres' proposals for change, however, uneasily marry sensible but predictable steps to moderate our lifestyles and insulate ourselves from some impending dangers with the more far-reaching agenda of developing a state of consciousness that creates connections between ourselves, our community and the planet.

Practical steps that could be taken, Ayres suggests, include a clear separation of the funding of science and education from industry and ending the private ownership of public policy by corporate interests. In the end, however, if 'God's offer' is to be taken up, then some belief in the divine nature of creation will have to become central.

Nick Robins

Nick Robins is Director of Sustainable Consumption and Trade at the International Institute for Environment and Development, London.

IN SEARCH OF THE FUTURE

EARTH ODYSSEY
Mark Hertsgaard
Broadway Books, New York, 1999, US$26.00 hardback

"Will the human species survive the many environmental pressures crowding in on it at the end of the twentieth century?" That is the 64,000 dollar question that Mark Hertsgaard, an American journalist, set out to answer – not just with library research and telephone interviews, but by seeing for himself.

It took seven years and a circumnavigation of the globe to discover whether things were really as bad as the environmentalists made out and to write this fascinating book. His aim, was not to find solutions, but "to describe our collective behaviour and ask where such behaviour is likely to lead."

Inevitably, the result is somewhat selective. Hertsgaard's encounter with famine and crushing poverty in the Horn of Africa forces him to reflect upon the way the well-to-do neglect the poor, on the

fundamental need to redress the growing imbalance of wealth and poverty, and on the hopelessness of trying to solve environmental ills if there is no bread on the table to start with.

His experience of traffic pollution in Bangkok sets off a fascinating chapter on 'the irresistible automobile'. In Bangkok he not only found children breakfasting on the back seat of the family car in predawn darkness, as the only means of getting to school on time, but the new auto necessity of choice: the portable toilet, without which the traffic jams become really unbearable.

The effect of a doubling of the world auto fleet by 2020 will, he points out, have a major impact on climate change since 40 per cent of the projected growth in greenhouse gas emissions is expected to come from cars and other forms of transport. By 2025, the increase in car use could be one factor leading developing countries to emit "four times as much carbon dioxide as the industrial countries do today" according to one United Nations estimate. A far cry from the 50-70 per cent reductions proposed by the International Panel on Climate Change.

In Russia, Hertsgaard finds evidence of a much greater nuclear disaster at Chelyabinsk than in Chernobyl, which itself may cause between 50,000 and 250,000 deaths in the former Soviet Union and an equal number in the rest of the world. Chelyabinsk, and nearby Mayak, were centres of nuclear weapons production during the Cold War and they have left a terrifying legacy of ill health and vast swathes of land which will be uninhabitable for centuries. One nuclear waste dumping ground, Lake Karachav, is itself an accident-in-waiting.

But it is the author's reporting from China, and his careful analysis of the 'population problem' which makes this book essential reading. While not accepting Lester Brown's more gloomy predictions about China's coming food crisis, Hertsgaard concludes that "for China to feed itself in the future, everything will have to go right: yields must rise to international levels, which means efficiency improvement in land, water, and fertiliser use have to be made and made soon; population growth has to be further slowed; and there is no room for unplanned but highly possible disasters, such as droughts and floods projected to occur under climate change."

On the broader question he sought to answer, Hertsgaard ends his personal odyssey with no doubt about the dangers ahead. "It seems plain to me that most of the key global environmental trends are moving in the wrong direction, and many are picking up speed."

The hope, he dares to venture, lies in the fact that most people want to do right by the environment and that economic and environmental health are not enemies, but can reinforce one another – making repairing the environment one of the biggest businesses of the coming century. "Development, not growth, must become our motto," he concludes.

John Rowley

WORLD CITIZEN

REBEL WITH A CONSCIENCE

Russ Peterson

University of Delaware Press, Newark, USA and Associated University Presses, London and Toronto, 1999, US$29.05, £25.00

Russ Peterson has been a 20th century trailblazer. Embued with unstoppable enthusiasm and a determination to do things his way, he has spent a lifetime in the service of science and the environment.

From humble Swedish stock, he was a rebellious chemist with DuPont, a campaigning Governor of Delaware – forcing through the conservation of its coast in the teeth of big business opposition – chairman of the President's Council on Environmental Quality, president of the Audubon Society, champion of population issues at the World Conservation Union (IUCN) and much more.

This book is a celebration of a life well led and an example of what one committed individual can achieve. And, naturally, Peterson remains an optimist about the future:

"To those who argue that our global family is careening toward disaster by pursuing a way of life that is unsustainable, I reply that we know how to avoid it. We know how to change the current trends. If we work together we *can* change them."

MILLENNIUM PRIMER

STATE OF THE WORLD 1999

Lester R. Brown, Christopher Flavin et al

Worldwatch Institute, Earthscan, 1999, £12.95

As a primer for the millennium, this book could hardly be bettered. Rather than the usual annual report on the state of the world, it takes a longer look back to 1900 and forward into the coming century. In doing so, it sharpens the certainty that "the fossil-based, automobile-centred, throwaway economy that developed in the West is not a viable system for the world, or even for the West in the long term."

How to replace it with an environmentally sustainable economy is the subject of an excellent final chapter by David Malin Roodman. It will have to be a thoroughgoing process, involving every sector of society, he says. Governments will have to work domestically and internationally to define and defend environmental limits in a way that does not stifle corporations. Business will have to seize the huge investment opportunities the transition to a sustainable economy offers, non-profit groups will have to shame and cajole both, and educated citizens will have to use their power as voters and consumers.

21ST CENTURY SCENARIOS

WHICH WORLD? GLOBAL DESTINIES, REGIONAL CHOICES

Allen Hammond

Earthscan, London, 1998, £18.95

Drawing on five years research by the World Resources Institute and other agencies, Allen Hammond presents three possible scenarios for the future: a Market World, a Fortress World and a Transformed World.

In the first, developing countries are successfully integrated into a vibrant global economy, spurred on by economic reforms and technological innovations. In the second, this hopeful prospect is brought crashing down as market-led growth results in hideous extremes of inequality and environmental disaster, causing the rich to retreat into a fortified enclave in a sea of misery, which threatens both them and the earth they depend upon.

The third scenario envisions a transformation in social and political policies which supplement and direct market forces, thus "enabling humanity to manage a planet and a global human civilisation in way which will sustain them indefinitely." Backed up with a wealth of trend analysis and regional insights, this book succeeds in taking what Murray Gell-Mann called "a crude look at the whole" which is of immense value.

ALSO RECOMMENDED

NATURAL CAPITALISM: THE NEXT INDUSTRIAL REVOLUTION

Paul Hawken, Amory B. Lovins and L. Hunter Lovins

Earthscan, London, £18.99

This long-awaited successor to *The Ecology of Commerce* and *Factor Four* attempts to provide a shared framework that could "harness the talent of business to solve the world's deepest environmental and social problems." This, the authors explain, goes far beyond the pursuit of eco-efficiency to incorporate reinforcing principles of economic, social and environmental policy.

This is an ambitious and stimulating book with plenty of down-to-earth examples of the payoff which this new approach to business can bring. It sees a hopeful future in a world that values the natural capital of resources, living systems and ecosystem services just as much as human, financial and manufactured capital. It is a change in direction, they believe, that will dominate the 21st century and which is not only necessary, but possible and practical. Captains of industry please note.

FUTURE POSITIVE

Michael Edwards

Earthscan, London, 1999, £20.00

This book sets out a carefully argued vision for a reformed international system based upon genuine co-operation between all the partners. It argues for a global regime that is "light but firm": with a small core of negotiated rules relating, for example, to global pollution targets and human rights, and that "humanises capitalism" without interfering too much with market mechanisms or personal freedom.

JR

ISSN 0968-1655

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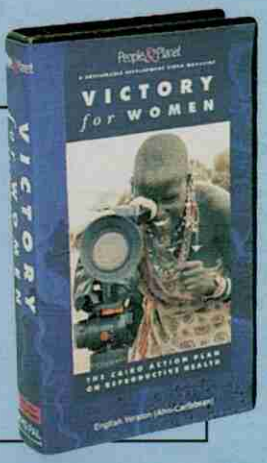

***People & the Planet* is published quarterly by Planet 21,** 1 Woburn Walk, London WC1H 0JJ. Tel: (+44 171) 383 4388 Fax: 388 2398
E-mail: planet21@netcomuk.co.uk and on the World Wide Web: http://www.oneworld.org/patp/
People & the Planet is printed on chlorine-free recycled paper by the Lavenham Press,England.